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Workshop on Dental Operatory Design and Equipment Layout

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WORKSHOP ON DENTAL OPERATORY DESIGN AND EQUIPMENT LAYOUT
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Edited by

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REPORT OF WORKSHOP
CONFERENCE ON DENTAL OPERATORY DESIGN
AND EQUIPMENT LAYOUT

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INTRODUCTION AND STATEMENT OF OBJECTIVES

A clinical research project was undertaken at the Naval Dental Research Institute, Great Lakes, Illinois in 1966 for the purpose of testing and evaluating a concept of dental operatory equipment and clinic design. This was a direct result of two Navy Dental Research Conferences held in 1964 at the Naval Dental School. These conferences concluded with the recommendation that the research program be developed in order to adapt the latest knowledge and technology in dentistry to improved treatment of Navy and Marine Corps personnel. Further it was recommended that this program be organized around four basic concepts of dental practice: (1) surgical asepsis for procedures and environment, (2) team type of practice for the dentist and the assistant, (3) operatory versatility to fit all specialties of practice, and (4) reduced stress and strain for the operatory, assistant, and patient.

The research project was activated under BUMED approved Work Unit M4114.04 3002 entitled "Research in Dental Operatory Design and Equipment Layout." The principal investigator for this study was Captain Lloyd M. Armstrong, DC, USN, with coinvestigators being Captain Gordon H. Rovelstad, DC, USN, and Commander Robert W. Longton, DC, USN. Lt. Paul O. Walker, DC, USNR, and DT/1 Bobby Priest, USN participated and provided assistance throughout the study.

Areas for study were defined, equipment was selected, procedures were established and clinic layout was designed. Specific emphasis was given to the total concept, accepting the following basic standards for practice as either documented in the literature or demonstrated in clinical practice: (1) surgical asepsis in dental practice is desired in order to prevent cross-infection of patients, dentist and assistant, as well as to prevent infection of surgical sites; (2) dental treatment can be provided more effectively by full utilization of dental assistants; (3) dental operatory requirements for various specialties are similar in all aspects except for the variation in instruments, supplies and materials; (4) reduced stress and strain for the dentist and assistant can be accomplished by operating from the seated position and greater comfort for the patient can be accomplished by placing him in a supine position.

After preliminary testing of equipment and procedures, a full scale operatory model of a dental clinic to meet the above standards was constructed consisting of five conventional dental operatories defined as the control clinic, and five experimental dental operatories defined as the experimental clinic. Both the experimental clinic and the control clinic were supported by an appointment desk, examining room, and x-ray room.

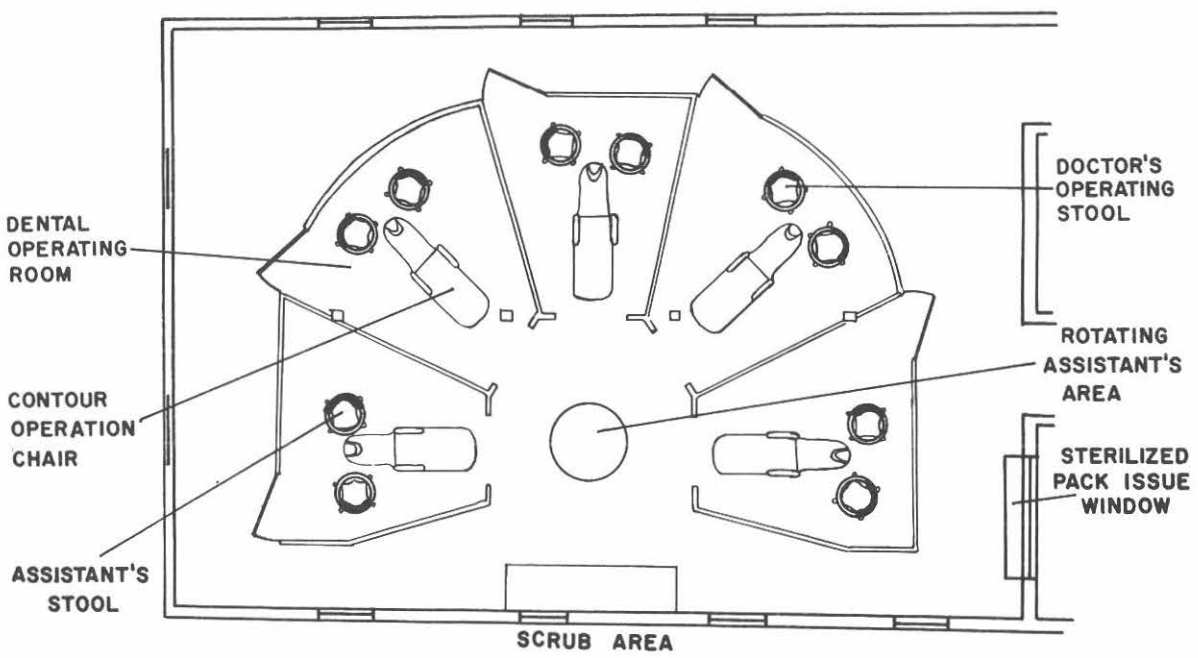


Figure 15. Five chair experimental dental operating suite.

The complete description of the experimental clinic, the equipment, layout, instrumentation and procedures were fully described in NDRI Research Report NDRI-PR 67-03 dated 30 August 1967. The experimental clinic is illustrated in the excerpt from the report below.

(3) Experimental Clinic Design. The position of the rotating dental assistant in relation to the dental operating team and the patient was programmed to allow direct access of the rotator to each of five dental operatories (Fig. 15). With the rotator positioned in the center, the operating rooms were placed radially in five directions with each room being 3'9" from the rotator's stand. This gave the rotator an opportunity to observe the five operatories and to circulate among them with minimal movement. The configuration and design of the dental operating suite was that of a circle, with the patient's head placed toward the periphery. The space required for each experimental dental operating room (Fig. 14) was such that when five dental rooms were placed side by side they comprised approximately five-eights of the entire circle. The unused three-eighths of the circle was the site of the scrubbing sink used by the five operating teams. Gowning and gloving procedures were carried out in this space.

Each operatory was separated from each other in order to define certain areas or boundary limits and to provide privacy to dental patients. This was accomplished by placing temporary partitions around three sides of each dental operating space.

(4) Rotator Stand. The rotating assistant dispensed mixes of materials to the five dental operating rooms from a centrally located rotator's stand (Fig. 6). This stand was designed and constructed to allow the rotating assistant to provide the maximum service to the most operatories in the minimal amount of time and with the least amount of wasted effort. The stand itself was mounted on a central pedestal on the floor. An electrical supply was provided through the center of the pedestal to two electrical outlets at the top of the center post. Four circular stainless steel shelves, thirty inches in diameter were mounted on the stand and rotated independently of each other. The supplies and materials were arranged on these shelves for delivery to the dental operating rooms. Some of these items included silver alloy pellets, mercury, cement silicate, cavity liner, rubber dam clamps, dental burs, and so forth. Every item was properly sterilized and placed in a holding solution or in paper envelopes. They were delivered to the working trays in the dental operating rooms in such a manner so as to prevent cross-contamination of items on the rotator's stand. Dental

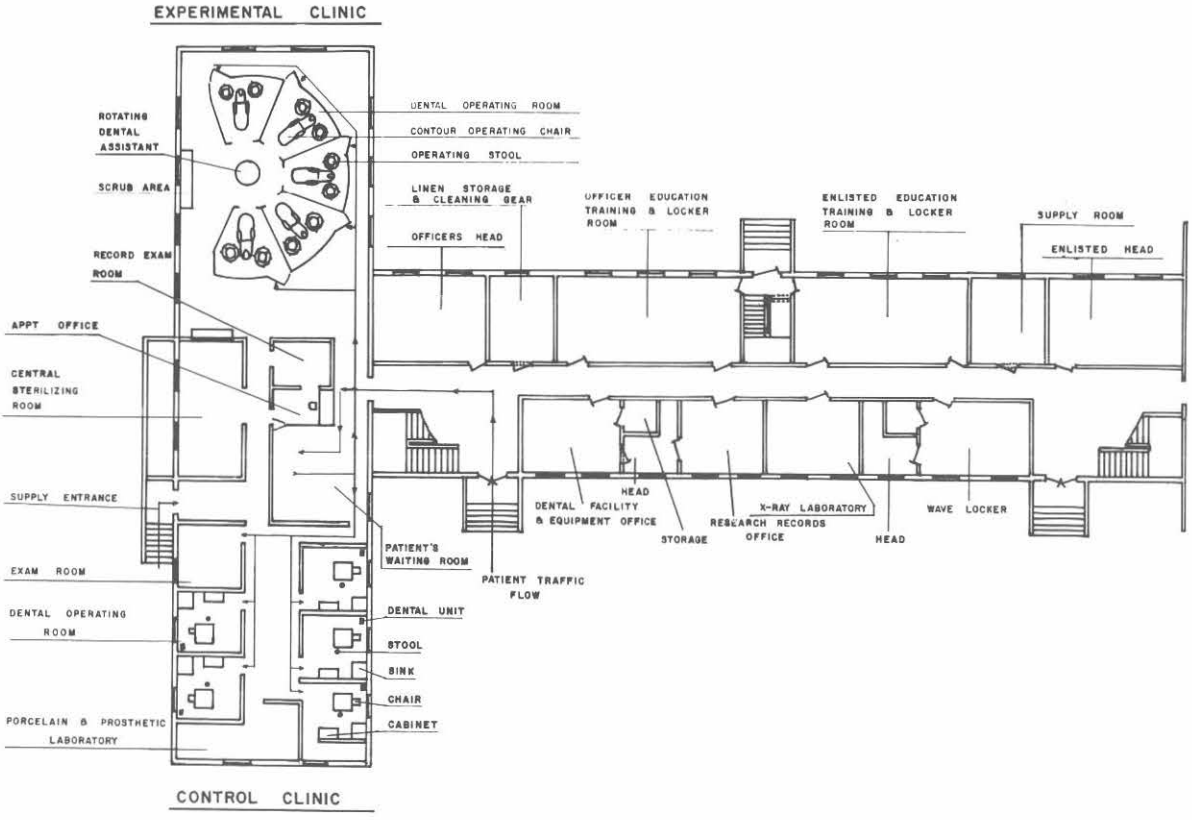


Figure 16. Dental facility developed to support the study of clinical evaluation of office design and equipment layout. Both the experimental clinic and a "control" clinic are illustrated, the latter to be used for comparison studies.

materials were not sterilized before being delivered to the dental operating rooms since they were considered not to be contaminated by patients or operating teams in the dental operating suite, and were handled as disposables.

(5) Records Examination Room. Supporting spaces for the clinic included a records examining room (Fig. 16) located adjacent to the dental appointment desk. Here the dentist reviewed the dental record and examined the roentgenograms on wall-mounted viewer boxes. At this time the dental officer would determine the procedures to be accomplished at this appointment. The dental records would remain in the examining room but the rotator would place the x-rays on the viewer box in the dental operatory (Fig. 9) for intermittent viewing by the operator.

(6) Dental Examining Room. A dental examination room (Fig. 16) was also set up in support of the clinic. Here dental patients were examined and charts made out. This room was also used for consultations and post-operative treatment. The room was equipped with conventional equipment with the exception of the dental operating chair which was a modern contoured chair. Preventive dentistry treatments and cavitron scalings were handled in the examining room. Diagnostic aids including study models and Panorex roentgenograms were gathered in the examining room prior to making a diagnosis and developing a treatment plan.

(7) Dental X-Ray Room. The dental x-ray-room (Fig. 16) was also part of the supporting spaces. It included a Panorex machine with a dual control panel*. Patients were routed from the examining room to the x-ray room for their routine Panorex and bite-wing radiographs.

(8) Porcelain and Prosthetics Laboratory. (Fig. 16) Supporting facilities include a limited prosthetics laboratory where models could be poured, small castings fabricated and porcelain restorations fused. Polishing and finishing equipment was also available for prosthetic appliances. Prosthetics service may be provided to patients in the clinic without causing the patient to be reappointed or transferred to another dental clinic. Heavy castings and denture processing was accomplished at a central dental laboratory.

After an initial period of operating both the experimental and the control clinics, a series of test periods were established during which time patients were treated, and selected comparative data collected. The dental officers and dental technicians for the operation of these clinics were supplied by the Dental Department of the Administrative Command, Naval Training Center, Great Lakes, as were the patients. Over 7,000 patients were treated in these clinics by 27 different dental officers assisted by 28 different dental technicians. Both experienced dental officers as well as recent graduates were utilized in the clinics, the majority during the test periods being recent graduates. The patients were Navy recruits.

*Panorex, Model 90 with additional extension and 90 kv tubehead, S. S. White Company, Philadelphia, Pennsylvania.

This workshop was convened for the purpose of observing the clinics in full operation, and to review the preliminary findings of the comparative studies in order to consider the experimental design for future use in the Navy; to make recommendations for further study of the future needs of the Naval Dental Corps regarding the four basic concepts defined by the 1964 Workshops.

Agenda for Workshop

Wednesday, 31 January 1968

0745	Buses pick up participants at B. O. Q.
0800	Opening session--Introductions and welcome, Bldg. 600.
0900	Review of Research Project M4114. 04-3002, and demonstration.
0945	Coffee break
1000	Observe experimental clinic in operation, Bldg. 607.
1145	Board buses for Bldg. 140.
1200	Luncheon, South dining room, Bldg. 140.
1300	Visit dental trailer, Building 140 parking lot.
1330	Research reports, Main dining room, Building 140.
1500	Coffee break.
1515	Research reports (continued)
1700	Social hour.
1800	Buffet Dinner, south dining room.
1900	Workshop I, Session I, "Project Evaluation."
2100	Close of Workshop I, Session I.

Thursday, 1 February 1968.

0800	General Session, Bldg. 140, main dining room.
0815	Workshop I, Session II, "Project Evaluation."
1000	Coffee break.
1015	Reports of study groups.
1200	Luncheon--remarks by Rear Admiral Frank M. Kyes.
1330	Workshop II, "Future Needs of the Navy Dental Corps."
1500	Coffee break.
1515	Reports of study groups.
1600	Summary of conference.
1630	Closing remarks by Rear Admiral Frank M. Kyes.

Instructions to Participants

This workshop has three components: First to receive a report of a research and development project on operatory design and equipment; second, to serve, in workshop fashion, as a

panel of experts to review the findings of the study and respond as potential users; and third, to make recommendations for meeting the future needs of the Naval Dental Corps.

A great deal has to be accomplished in a short time, and therefore, a full schedule has been planned, which, if followed, will make it possible to complete the task in the two days available.

Each individual should seek out information during the reports of research results as well as during the demonstration and observation periods in order that it can be available for discussion during the study group sessions. The strength of the study groups will be in the contributions made by the participants. The chairman of each study group will guide the discussion in relation to the assigned task but will be seeking specific comments and recommendations from the participants that can be included in a workshop report. Care should be taken to avoid random discussion that cannot materialize in a serious recommendation. However, each participant should feel free to introduce new material pertinent to the assigned task.

Your assistance is very much appreciated.

The reports of participants are presented on the following pages as (1) Research Reports; (2) Reports of Study Groups, Workshop I; (3) Reports of Study Groups, Workshop II; (4) Summary.

"Comparison of Experimental Clinic with Conventional clinic"

Captain Lloyd M. Armstrong, DC, USN

Introduction and Methods

Eight test periods were set up after the clinics were staffed and operated for a period of preliminary trials. Each test period was of one week duration. In all test periods, five dental officers and five dental technicians were assigned to the control clinic so that in each operatory one dental officer and one dental technician carried full responsibility for patient treatment, preparation of materials and instrument sterilization and storage. Each conventional operatory was equipped with instruments and supplies, instrument cabinets, autoclave, dry heat sterilizer, recent model dental unit and dental chair.

In all test periods dental officers and dental technicians were assigned to the experimental clinic so that one dental officer and one dental technician were assigned to each operatory. In addition, one dental technician was assigned to the central sterilization room and one dental technician to a rotator stand as a rotating assistant. Thus a total of five dental officers and seven dental technicians were assigned to the experimental clinic. Each operatory was equipped with a dental chair having a compact chairmounted "unit" for two dental handpieces, an air-water-spray syringe, and a high volume evacuator, and an overhead operatory light. All supplies were provided as needed by the rotating assistant. All instruments were cleaned, sterilized and stored in packs in the central sterilizing room and delivered to the operatories as needed.

Operating stools for both the dental officers and the dental technicians were available in both clinics. Modern concepts of practice were maintained in both the control clinic and the experimental clinic, using rubber dam and direct vision. Patients were placed in a reclining position. Dental officers operated from the seated position, with chairside assistants being similarly seated. All instruments were sterilized utilizing autoclaving or dry heat techniques. Ethylene oxide sterilization was used for the equipment which could not tolerate heat.

Dental officers and technicians were assigned for specific test periods, being rotated between test periods. Prior to each test period, orientation and training was provided in order to establish standards and procedures.

The conditions for this study are summarized below:

I General
1. Source of patients
   a. recruits
   b. staff personnel
   c. service school personnel
2. Previous examination of patients
   a. recruits -- initial dental examination
   b. all others -- sick call from Bldg. 600.
3. Operative dentistry treatment only, provided.
4. Patient assignment is impartial to both clinics.
5. Appointment clerk maintains records and assigns patients for both clinics
6. Records examination room is used by experimental clinic to:
   a. Examine patients records and view x-rays.

II Control Clinic:
1. DOR is rectangular (10 feet by 9 feet) except C-5.
2. All equipment and instruments selected from the Federal Stock Catalog or GSA contract source.
3. Three different dental units:
   a. SS White (two)
   b. Ritter Modulaire (two)
   c. Weber P-64 Unette (one)
4. Five different dental operating chairs:
   a. Ritter Vega with straight back (C-1)
   b. Ritter Vega with conventional head rest (C-3)
   c. SS White Revelation with straight back (C-4)
   d. SS White Revelation with detachable headrest (C-2)
   e. Den-Tal-Ez contour chair (C-5)
5. Three different dental operating stools:
   a. Pedigo
   b. Vacudent Flex Aire
   c. Den-Tal-Ez Posture Comfort stool
6. Examination room for unscheduled patients and short appointments.
7. Each DOR functions independently as a unit.
8. All routines are conventional with the exception of three minor changes:
   a. Three sets of operative instruments per operatory
   b. Two sterilizers in each unit
   c. Rubber dam used for all operative procedures

III Experimental Clinic:
1. DOR is trapezoidal, three sided, private. E-3 is 75 square feet.
2. Clinic is circular.
3. Patients enter from outside or rim of wheel.
4. Staff operates from inside or hub of wheel.
5. Equipment is minimal, not specialized.
6. Dental unit is compact -- space saver.
7. Patients are supported in comfortable supine position.
8. Operating team remains seated throughout entire operation.
9. Instruments and supplies are delivered from rotator stand.

10. Operating rooms are versatile -- can deliver any dental service.
11. Central scrub area for washing hands.
12. Utilities programmed through small flexible tube.
13. Complete aseptic technique may be employed

IV Central Sterilization Room:
1. CSR supports the Experimental Clinic by:
   a. Cleans and processes all instrument packs
   b. Sterilizes all instrument packs
   c. Stores sterile packs
2. Sonic energy cleaner removes all debris from instruments.
3. Instrument sharpener for touching up all cutting instruments.
4. Sorting and packing area.
5. Accepted methods of sterilization:
   a. Dry heat oven
   b. Steam under pressure (autoclave)
   c. Gas clave
6. Storage area for storing sterile packs
7. Prepared instrument packs:
   a. Operative pack
   b. Handpiece pack
   c. Hose pack
   d. Linen pack
   e. Bur tube

RESULTS

The results of the eight test periods are presented in tables 1 through 9. The total number of days worked by each dental officer was determined and summarized by clinic to which assigned. Additionally, the total amount of time spent treating patients, defined as "productive time," was determined for each dental officer and summarized according to clinics. The amount of treatment completed in each clinic was recorded as "surfaces restored." The productive time was then related to surfaces restored and expressed as numbers of surfaces restored in 100 minutes. By this means, the base line for comparison of efficiency becomes the "productive time!'

The first evaluation was performed during the period August 14 to 18, 1967. The dental officers had been assigned to the clinics two weeks previously for indoctrination and training. The control clinic was operated following hourly appointments while the experimental clinic was operated on long appointments, completing as much as possible for each patient during the appointment period. Seventy-one (71) patients were appointed to the control clinic and 55 to the experimental. The results as seen in Table 1, show little difference between the two clinics for this first test period. However, the next two test periods, following the same appointment schedules, with new staff personnel, showed an increase of 5.1 and 3.3 surfaces/ 100 minutes respectively. One hundred and eight patients were appointed to the control clinic and 50 to the experimental clinic during the second test period (19-22 September, 1967), (Table 2), while 127 patients were appointed to the control clinic and 55 to the experimental clinic during the third test period. (16-20 October, 1967)

The two clinics were compared during the period 13-17 November, 1967 following hourly appointments only. One hundred and fifty-one patients were appointed to the control clinic and 159 to the experimental clinic. Under these conditions, the experimental clinic demonstrated a 2.6 increase in surfaces restored per hundred minutes as shown in Table 4. When both clinics were operated, following long appointments, the experimental clinic demonstrated a 2.8 increase in surfaces restored per hundred minutes as shown in Table 5. During this period, 74 patients were appointed to the control clinic and 79 to the experimental clinic. When the clinic was operated under the same conditions for an additional week, 27 November to 1 December, 94 patients being scheduled for the control clinic and 95 to the experimental clinic, the increase in surfaces per hundred minutes, as shown in Table 6, rose to 3.8, a 40.9% increase.

During the seventh test period, conducted December 4-8, 1967, 90 patients were appointed to the control clinic and 86 to the experimental clinic, with long appointment schedules. An increase of production was of 2.2 surfaces per 100 minutes (Table 7). When only 67 patients were appointed to the control clinic and 55 to the experimental clinic during the period from 11 to 15 December, the increase of treatment in the experimental clinic dropped to 1.6 surfaces per 100 minutes (Table 8).

Table 9 sums up the whole series of test periods, demonstrating a 35 percent greater efficiency of the experimental over the control clinic. There were 10.4 surfaces restored per 100 minutes in the experimental clinic compared to 7.7 surfaces in the control clinic.

DISCUSSION

The results of these evaluations demonstrate a greater number of surfaces restored per 100 minutes in the experimental clinic during all test periods except for the first test period as shown in Graph 1. There was a 37% increase when both clinics were operating on hourly appointments which increased to as high as 42 percent when both clinics were operated on long appointments. These comparisons were made on the basis of productive time per surface so that variations between clinics in staffing for administrative reasons were equaled.

Comparison of eleven dental officers' performance in the control clinic to the same officers in the experimental clinic is shown in Graph 2. Even though there was considerable variation in individual performance, all demonstrated a greater number of surfaces restored in the experimental clinic than in the control clinic regardless of test period conditions.

Four dental officers were evaluated through a double rotation, starting with the control clinic,

next to the experimental clinic and then back to the control clinic. Again, even though there was considerable individual variation there was greater treatment provided in the experimental clinic than in the control clinic as shown in Graph 3. The experience in the experimental clinic, however, improved the technics of one of the officers as reflected in the results of the second control clinic experience.

SUMMARY

The experimental clinic functioned effectively throughout all the test periods. There was a consistent increase in operative treatment associated with the experimental clinic over the control clinic regardless of appointing methods. This increase varied between 22% and 42% when compared on equivalent appointment methods.

Table 1

Comparison of Experimental Clinic following long appointments to Control Clinic following hourly appointments August 14-18, 1967

First Test Period	C*	E*	±*
Total days worked	11.5	15.0	+3.5
*Total productive time	2420.0	3379.0	+959.0
Productive time per patient	34.0	61.0	+27.0
Productive time per day	210.0	225.0	+15.0
Productive time per surface	10.6	11.0	+0.4
Surfaces restored in 100 min.	9.4	9.0	-0.4

C* = control
E* = experimental
±* = difference

* Total productive time is the total time spent operating on the patient.

Table 2

Comparison of Experimental Clinic following long appointments to Control Clinic following hourly appointments September 19-22, 1967

Second Test Period	C*	E*	±*
Total days worked	18.5	13.5	-5.0
Total productive time	3658.0	2169.0	-1489.0
Productive time per patient	34.0	43.0	+9.0
Productive time per day	198.0	161.0	-37.0
Productive time per surface	13.2	7.9	-5.3
Surfaces restored in 100 min.	7.6	12.7	+5.1

C* = control
E* = experimental
±* = difference

Table 3

Comparison of Experimental Clinic Following long appointments to Control Clinic following hourly appointments October 16-20, 1967

Third Test Period	C*	E*	±*
Total days worked	23.0	20.0	-3.0
Total productive time	5940.0	4903.0	-1037.0
Productive time per patient	47.0	88.0	+41.0
Productive time per day	258.0	245.0	-13.0
Productive time per surface	14.6	9.8	-4.8
Surfaces restored in 100 min.	6.9	10.2	+3.3

C* = control
E* = experimental
±* = difference

Table 4

Comparison of Experimental Clinic to Control Clinic following hourly appointments November 13-17, 1967

Fourth Test Period	C*	E*	±*
Total days worked	25.0	24.5	-.5
Total productive time	6804.0	6193.0	-611.0
Productive time per patient	45.0	39.0	-6.0
Productive time per day	272.0	253.0	-19.0
Productive time per surface	14.4	10.5	-3.9
Surfaces restored in 100 min.	6.9	9.5	+2.6

C* = control
E* = experimental
±* = difference

Table 5

Comparison of Experimental Clinic to Control Clinic following long appointments November 20-24, 1967

Fifth Test Period	C*	E*	±*
Total days worked	18.0	19.0	+1.0
Total productive time	4811.0	4363.0	-448.0
Productive time per patient	65.0	55.0	-10.0
Productive time per day	267.0	230.0	-37.0
Productive time per surface	14.8	10.4	-4.4
Surfaces restored in 100 min.	6.8	9.6	+2.8

C* = control
E* = experimental
±* = difference

Table 6

Comparison of Experimental Clinic to Control Clinic following long appointments
November 27 - December 1, 1967

Sixth Test Period	C*	E*	±*
Total days worked	17.0	17.0	---
Total productive time	4586.0	4160.0	-426.0
Productive time per patient	49.0	44.0	-5.0
Productive time per day	270.0	245.0	-25.0
Productive time per surface	10.7	7.6	-3.1
Surfaces restored in 100 min.	9.3	13.1	+3.8

C* = control
E* = experimental
±* = difference

Table 7

Comparison of Experimental Clinic to Control Clinic following long appointments
December 4-8, 1967

Seventh Test Period	C*	E*	±*
Total days worked	19.5	22.0	+2.5
Total productive time	5072.0	5551.0	+479.0
Productive time per patient	56.0	65.0	+9.0
Productive time per day	260.0	252.0	-8.0
Productive time per surface	13.3	10.3	-3.0
Surfaces restored in 100 min.	7.5	9.7	+2.2

C* = control
E* = experimental
±* = difference

Table 8

Comparison of Experimental Clinic to Control Clinic following long appointments
December 11-15, 1967

Eighth Test Period	C*	E*	±*
Total days worked	18.5	13.5	-5.0
Total productive time	4380.0	3423.0	-957.0
Productive time per patient	65.0	62.0	-3.0
Productive time per day	237.0	254.0	+17.0
Productive time per surface	13.3	10.9	-2.4
Surfaces restored in 100 min.	7.5	9.1	+1.6

C* = control
E* = experimental
±* = difference

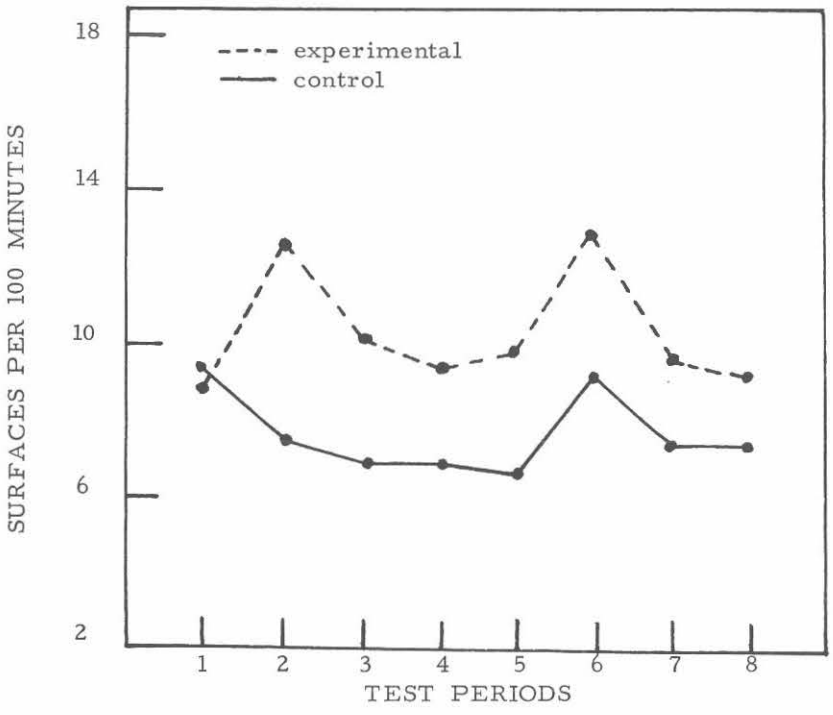
Table 9

Comparison of Experimental Clinic to Control Clinic for all test periods

Total Test	C*	E*	+* -
Total days worked	151.0	144.5	-6.5
Total productive time	37671.0	34141.0	-3530.0
Productive time per patient	48.0	54.0	+6.0
Productive time per day	247.0	233.0	-14.0
Productive time per surface	13.3	9.8	-3.5
Surfaces restored in 100 min.	7.7	10.4	+2.7

C* = control
E* = experimental
+* = difference
-

GRAPH I



COMPARATIVE CLINICAL ANALYSIS

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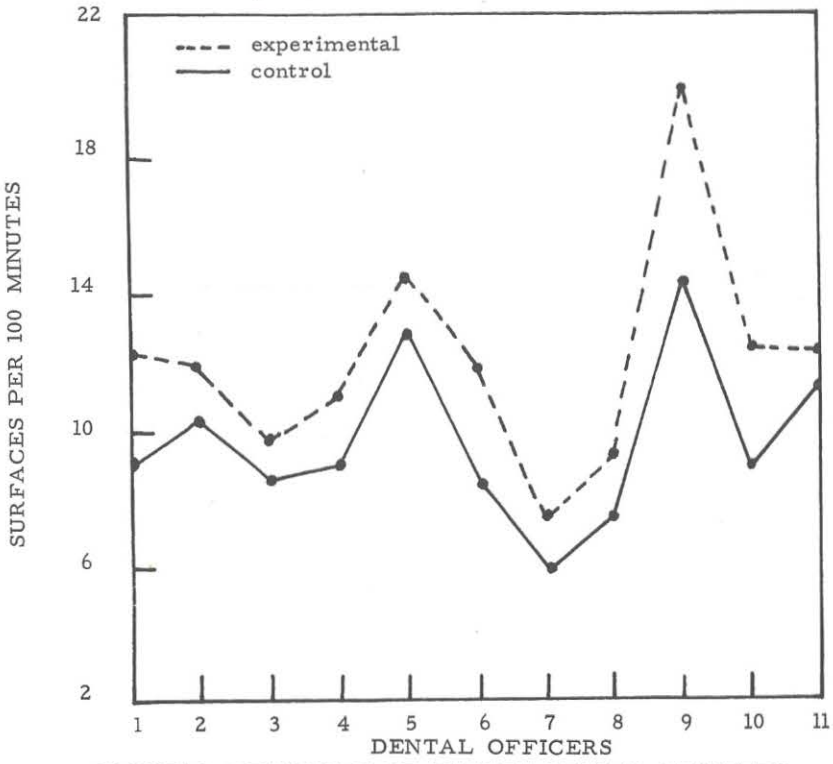
1968

GRAPH II



CLINICAL RESPONSES OF ELEVEN DENTAL OFFICERS
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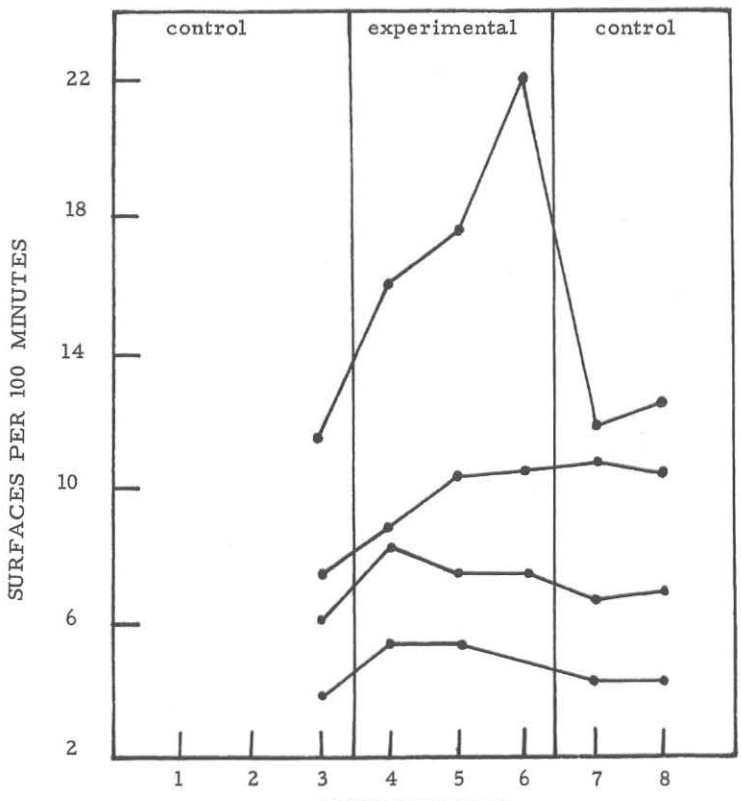
GRAPH III



COMPARATIVE ANALYSIS OF FOUR DENTAL OFFICERS
NDRI - Great Lakes

"The Reaction of Dental Officers"

Lt. Paul Walker, DC, USNR

I. Introduction and Methods

The reaction of the Dental Officers using the experimental and the control clinics was subjectively evaluated using the following methods. Dental officers were selected who had no previous experience in either clinic. Assignments were made to the clinics for a period of one or two months depending upon the conditions of the experiment. An identification number was assigned to each officer. They were instructed to complete a series of questionnaires during or at the end of the test period. One form supplied gave general information about the officers' experience. The other forms gave the officers an opportunity to express satisfaction or dissatisfaction with the equipment, layout and procedures in both the control clinic and the experimental clinic.

II. Results

First-year officers with one year experience are identified as Group I and officers with two years experience as Group II.

The questionnaire responses of the Group II officers in the Control Clinic were first compared to the responses of the Group II officers in the Experimental Clinic. Finally the responses of all the dental officers, Groups I and II, were evaluated.

As shown in Table I, all officers were pleased or satisfied with the following equipment: (1) High-speed handpiece, (2) Low-speed handpiece, (3) Operating stool, (4) The dental chair, (5) Back up table, and (6) Rotator stand.

The greatest dissatisfaction was with the Evacuation System and the Three-Way syringe.

All Group II officers were pleased or satisfied with each aspect of the experimental clinic as shown in Table 2. Dissatisfaction in the control clinic was indicated for the following items: (1) instrument handling, (2) overall operating room procedure, (3) operating room environment, (4) instrumentation, (5) chairside position, and (6) contamination.

When comparing Group II officers to Group I officers working in the experimental clinic, presented in Table 3, it was found that all Group II officers were satisfied or pleased with all phases of the experimental clinic. However, the Group I officers were dissatisfied with the overall operating procedure and the chairside position.

All officers, Group I and II, while working in the experimental clinic were pleased or satisfied with the overall routine, while in the control clinic only 60% of the officers were pleased or satisfied and 40% of the officers were dissatisfied. This is shown in Table 4.

III. Discussion

From these results it appears that the majority of dental officers enjoyed working in the experimental clinic with its new configuration, new equipment, and different concepts of operation. The officers were also pleased with the dental chair and operating stool. This indicates that the dental officers enjoyed and accepted sit-down dentistry utilizing direct vision with the patient in the supine position. First-year officers showed the greatest dissatisfaction with the equipment.

The greatest equipment difficulty was experienced with the evacuation system. Fifty percent of the officers were dissatisfied with this from an operational standpoint.

The second-year officers were overwhelmingly in favor of the Experimental Clinic. However, they did register some dissatisfaction with the instrument handling and instrumentation.

It is possible that more training or retraining along the lines of asepsis, prepared packs, and the utilization of four-handed dentistry is necessary.

IV Summary

The majority of the dental officers accepted and enjoyed working in the experimental clinic and were pleased with overall operation.

Table 1

Questionnaire response of 12 Dental Officers selected at random after using experimental clinic equipment.

	Pleased	Satisfied	Dissatisfied
Quick connect type dental unit	5	4	3
Dental Operating Light	6	3	3
Hi Speed Handpiece	8	4	-
Slow Speed Handpiece	6	6	-
Evacuation System	-	6	6
Dental Chair	9	3	-
Operating Stool	11	1	-
Three Way Syringe	5	3	4
Bracket Table	2	8	2
Back-up Table	7	4	1
Rotator Stand	7	4	1

Table 2

Questionnaire responses in percent of 7 second-year dental officers selected at randon after treating patients in Experimental and Control Clinics.

	Pleased		Satisfied		Dissatisfied	
Instrument Handling	67	(25)	33	(25)	-	(50)
O. R. Environment	67	(50)	33	(25)	-	(25)
Equipment	33	(25)	67	(75)	-	(--)
Instrumentation	33	(25)	67	(50)	-	(25)
Chairside Position	33	(--)	67	(75)	-	(25)
Patient Position	67	(50)	33	(50)	-	(--)
Contamination	33	(--)	66	(75)	-	(25)
Overall O. R. Procedure	-	(--)	100	(50)	-	(50)

NOTE: ( ) indicates control clinic

Table 3

Questionnaire responses in percent of 6 1st-year dental officers and 3 2nd-year dental officers selected at random after treating patients in Experimental Clinic

	Pleased		Satisfied		Dissatisfied	
Instrument Handling	67	(83)	33	(17)	-	(--)
O. R. Environment	67	(83)	33	(17)	-	(--)
Equipment	33	(50)	67	(33)	-	(17)
Instrumentation	33	(17)	67	(83)	-	(--)
Chairside Position	33	(17)	67	(33)	-	(50)
Patient Position	67	(33)	33	(50)	-	(17)
Contamination	33	(17)	67	(67)	-	(17)
Overall O. R. Procedure	--	(17)	100	(--)	-	(83)

NOTE: ( ) indicates 1st year dental officer

Table 4

Evaluation in percentages of 25 Dental Officer Questionnaire responses, as evaluated by 3 Dental Officers

	Research Clinics		
	Experimental	Control	Both
Pleased	77	39	53
Satisfied	23	19	20
Dissatisfied	0	42	27

"Reaction of Dental Technicians"

DT/1 Bobby Priest

Introduction

Dental technicians are one of the major groups of persons concerned with the operation of a dental clinic, its maintenance, and the operation and cleaning of the equipment and spaces. Therefore their reactions to the environment, equipment and overall operation of the Experimental Clinic has been evaluated in relation to a conventional clinic in which they have been trained and have worked.

Methods

A total of 28 different technicians were assigned to this project during the past year and three months. With the exception of the prosthetic laboratory, the project went into full operation in May 1967 with a staff of 17 general technicians. In December, one prosthetic technician was added. Ten technicians were transferred during the study. The technicians' assignments were as follows: five as chair-side assistants in the Control Clinic, and five as assistants in the Experimental Clinic. Additionally, one rotating technician and one central sterilizing room technician were assigned to the Experimental Clinic. Supporting areas of supply, records, x-ray room, examination room, prosthetic lab and appointment desk for both clinics were staffed with one dental technician each.

Each technician, with the exception of the prosthetic technician, went through a rotation period of from 2 weeks to 1 month, working as chair-side assistants in both clinics, in the CSR, as Rotator, in the Examination Room and as Appointment Clerk. After completing this rotation period the technicians were assigned to either the Control Clinic, the Experimental Clinic, or to one of the supporting positions. Upon being assigned each technician was asked to fill out a dental technician information form. This form contained general information. As the technicians rotated from one clinic to the other they were asked to fill out a dental technician reaction form (upon which they indicated which clinic they were leaving.) This form was used to obtain the technician reaction to specific areas and items within the clinic plus their reaction to the overall operation of that clinic. The latter was obtained by evaluations of the technicians' reactions on the form by three dental officers. Later, the reactions of the CSR Technician and the Rotator Stand Technician were obtained in the following manner: the five Dental Technicians that had worked in the CSR for the longest periods of time were asked to fill out a special questionnaire. This form was used to obtain an average of the number of persons required for the operation of the CSR when it was supporting the Experimental Clinic during different types of treatment. It was also used to evaluate the technicians' reactions to the design, size and duties of the CSR.

The four dental technicians that had worked as the Rotator Stand Technician on the longer period of time were asked to fill out a special questionnaire. This form was used to obtain an average number of persons required for the operation of the Rotator Stand when it was supporting the Experimental Clinic during different methods of treatment. It also evaluated the design, size and duties concerned with the Rotator and the Rotator Stand.

Information was also obtained on the average duties of the Rotator and the CSR Technician. This was accomplished by placing a person, not concerned with that operation of the project, within the immediate area of the Rotator Stand or the CSR and having him count the number of times specific functions were carried out.

Results

The responses of the technicians to clinical factors shared the highest area of satisfaction in the Experimental Clinic with the equipment, chair-side position, and operating room arrangement. Both clinics were equal in Instrument Handling. The Control Clinic was rated higher than the Experimental in sterilizing routines. An overall evaluation of the dental technician responses was made by three Dental Officers. Twenty-five percent more technicians were pleased or satisfied with the experimental clinic than with the Control Clinic. See Table 1.

The reactions of the CSR Technicians to the CSR design, size, and the duties performed indicated that all were either pleased or satisfied with the design and size of the CSR. Only one of five was dissatisfied with his duties as CSR Technician. (Table 2).

The average daily duties performed by the CSR Technician are shown in Table 3. This data was collected when the Experimental Clinic was working in a conventional manner, treating an average of 35 patients a day.

The responses of the CSR Technicians on the requirements for the number of CSR personnel for a complete aseptic technique, or a conventional operating technique, with the complete treatment program and a one-hour appointment program indicated a need for more staffing. Even with just the addition of ten patients a day it was felt that the CSR Technician allowance should be raised. (Table 4).

The duties of the Rotator Stand Technician for an average day is shown in Table 5. These results were compiled when the Experimental Clinic was working on one-hour appointments. Except for when working under complete aseptic techniques, the Rotator was at his busiest. The average individual operatory deliveries were 340 per day.

Table 6 shows a average reaction to the Stand Design, area size and the duties performed by the Rotator. All Rotating technicians were

either pleased or satisfied with the area size and their duties while 1 of 4 was dissatisfied with the design of the Rotator Stand.

Table 7 shows the recommendations of four dental technicians regarding staffing requirements for the Rotator Stand.

The overall responses of Dental Technicians as rated by 3 Dental officers, acting independently, is shown in Table 8.

Discussion

Every effort was made to see that answers given by the technicians were honest and without fear of threat or comeback by anyone connected with the project.

The data presented indicated that the technicians were definitely more satisfied with the Experimental Clinic than the Control Clinic. I believe that this satisfaction is justified. The equipment is simple and easy to operate. The chairside position is definitely more comfortable than that of standard clinics. The Operating Room Arrangements were simple to clean and keep clean.

I believe that I probably erred in asking those in the Experimental Clinic about Instrument Handling and Sterilizing Procedures. By the time they were filling out this questionnaire, they had put in two weeks to a month in the CSR and certainly these procedures were difficult for the average technician. The duties of CSR Technician were new and unusual to the trained general dental technician. It takes many weeks for a person to become really proficient in a CSR. We had, at one time, one technician who could operate the CSR efficiently under the heavier patient work loads. This man had received formal training at the Naval Hospital.

In discussing the Rotator Stand Technician I could never believe that one person could do the amount of work this technician does. Every Technician in the study would like to have been an efficient Rotator. Some could but most just do not have the speed. I believe that some of the short cuts they developed plus better equipment, such as faster and more automatic amalgamators, and pre-measured filling materials, could help all technicians become efficient Rotator Stand Technicians. One thing that could not be overcome was the 340 average daily deliveries to the operating unit. It was calculated that the Rotator walked 3.11 miles per week taking supplies to the unit. Then he has to walk back.

Summary

It was shown that the Dental Technicians prefer a clinic of the Experimental Design to a Clinic of the Conventional design. It was also shown that Dental Technicians can handle expanded duties of CSR Technician and Rotator and like doing so.

It was shown that for a complete aseptic technique, both the number of CSR Technicians and Rotators would have to be increased. This might be overcome through more formal training, but it is unproven at this time.

Table 1

Reaction of 19 Dental Technicians to Clinic Factors Expressed in Percent

	Pleased		Satisfied		Dissatisfied	
Instrument Handling	61	(41)*	33	(53)	6	(6)
O. R. Arrangement	84	(41)	10	(29)	6	(30)
O. R. Environment	66	(64)	28	(18)	6	(18)
Equipment	50	(35)	44	(25)	6	(40)
Instrumentation	78	(65)	22	(18)	-	(17)
Sterilization Routine	45	(47)	33	(53)	22	(--)
Storage and Delivery	22	(18)	72	(70)	6	(12)
Cleaning and Preparation	28	(12)	72	(76)	-	(12)
Chairside Position	6	(6)	61	(35)	34	(59)

* Experimental Clinic
*( ) Control Clinic

Table 2

Reaction of five Dental Technicians expressed in percent to CSR design size and duties

	Pleased	Satisfied	Dissatisfied
Design	100		
Size	20	80	
Duties	20	60	20

Table 3

Daily average of CSR Technician duties based on four working days with average of 4.5 Dental Officers per day

Packs, tubes and envelopes	188
Equipment Operation	18
Miscellaneous (linen and supplies replenishment, trash disposal, etc.	4

Table 4

Reactions of five Dental Technicians expressed in percent to CSR personnel requirements for patient treatment support

	Complete support for Aseptic Techniques		
	1 Tech.	2 Techs.	3 Techs.
25 pts. per day		100	
35 pts. per day		80	20

	Support for Conventional Operating Techniques		
	1 Tech.	2 Techs.	3 Techs.
25 pts. per day	60	40	
35 pts. per day		100	

NOTE: Average experience was 2.4 months

Table 5

Daily average of Rotator Stand Technician duties based on four working days with average of 4.5 Dental Officers per day.

Seats Patients	19
Mixes Filling Materials	55
Operatory Deliveries	340
Miscellaneous (Trips to CSR, trash, cleans stand, etc.)	30

Table 6

Reactions of four Dental Technicians expressed in percent to Rotator Stand design, area size and duties.

	Pleased	Satisfied	Dissatisfied
Design	25	50	25
Area Size	25	75	
Duties	75	25	

Table 7

Reactions of four Dental Technicians expressed in percent to Rotator Stand personnel requirements for patient treatment support.

Complete support for Aseptic Techniques

	1 Technician	2 Technicians
25 pts. per day		100
35 pts. per day		100

Support for conventional Operating Techniques

	1 Technician	2 Technicians
25 pts. per day	100	
35 pts. per day	75	25

NOTE: Average experience was 2.75 months.

Table 8

Evaluation in percent of 35 Dental Technician Questionnaire Responses, as evaluated by 3 Dental Officers.

	Research Clinics		
	Experimental	Control	Both
Pleased	70	41	56
Satisfied	24	28	26
Dissatisfied	6	31	18

"Evaluation and Use of the Radial Configuration in Dental Operating Space Design"

Dr. Lloyd B. Chaisson
Professor and Chairman of the Department
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Northwestern University, Chicago, Illinois

Dentistry has long been bound by tradition, yet the curriculum and the practice of dentistry has markedly changed in the last decade. This has happened in spite of deeply rooted heritage and traditions. I am not saying that we should ignore tradition and heritage. They are very basic and important things. We should use them and when applicable build on them. We should not depend on them, and in effect maintain the "status quo." We must constantly search for new avenues of knowledge and practice. To be complacent and dwell with the status quo today is to stand still. To stand still and not to be innovated is to be left behind. Far behind.

You gentlemen are administrators, innovators, and educators, perhaps as much as to any other contemporary professional group. You have observed first hand the results of our dental curriculum. You have worked with the complete spectrum of our young dental graduates. You have observed their behavioral patterns. You have made vigorous efforts to improve them. By your efforts you have extended their training and knowledge. You have observed their motivation (or lack of it) and have given them opportunity to develop and extend their knowledge and skills. You are searching with us for new concepts in practical application of dental treatment and you are helping us, as educators, in your research! You are extending your program to the very basic area of patient education and appreciation.

Change is all important, but not change for the sake of change alone. This new concept no matter how it is applied must embrace technical competency and exploit meaningful advances in social, biological, and material science.

Flexibility must be built-in to accomodate meaningful scientific changes. An awareness of new social concepts, new legislation, shifting economics, and constantly oscillating demands must be molded into the total format of any dental program, military or civilian.

There is no doubt that health is a natural resource and perhaps the most basic one in the United States. The armed forces have had this philosophy for decades. It is not, therefore, unique that this concept is being extended to the rest of the population. Total health service, without much doubt, will be available to all the people in the not too distant future: whether or not they can pay for it. Health care, like education, is now almost regarded as a right -- not a privilege.

Practitioners of dentistry must assume an increased responsibility to implement community, governmental and other dental programs and, therefore, successfully discharge their role as productive members of the health profession. Comprehensive oral health service must optimize the use of a scarce resource--: namely, thoroughly trained people.

The evaluation of adequate education and training is your forte--something that you excel in. You may observe the results of our educational process in dentistry. This is difficult if not impossible for the campus-bound teacher of dentistry to do. Professional behavioral patterns are what you see--the direct result of training in our dental schools.

Why do some young dentists, and older ones too, develop certain immobile postures and unique facets in their professional behavior? Some are desirable, some not so desirable. Why are some motivated; why are some not? These are social and psychological areas that need much research.

You can observe a dental officer operate in the new experimental clinic and generate many facts and figures about his behavior and skills. But does his previous training preclude your being able to tell him the facts and the statistics about himself and about his operating habits? Rather does he resent this intrusion into his personal world, into his personal work habits? I do not know for sure but I would suspect his previous background and exposure in the dental education system might render him suspicious, uninterested or unimpressed with your figures. Yet this is the same person, in many instances, that will seek out and pay $1,000.00 for a course in practice management.

What are we to do about their attitudes and feelings? I think that an intensive unlearning process must be inculcated in people that participate in such programs as you are experimenting with. Their indoctrination has to be complete and advantages have to be shown and explained. Why do I say this? I say this for a very explicit reason.

The authority figure (during their educational process) has influenced the student in professional and personal matters and this has firmly set his professional behavioral patterns. It is not unthinkable to presume that these patterns, developed in the confines of the school, will be carried over into the private practice or military practice of dentistry in a linear fashion--with little or no change in many instances. The physical environment of their school and the basic philosophy of their teachers has influenced these young men. Will they, therefore, submit to an unnatural (for them) concept without explicit and rigorous training? I think it may be doubtful. I also think it can be done with a concept that is quite simple. Participation in such a program as Capt. G. H. Rovelstad, DC, USN, and Capt. Lloyd Armstrong, DC, USN, have developed must surely be operated as an extension of the dental educational process. Had the new graduate come from a learning environment and operating configuration as you present him with, he would phase in with few, if any, problems. In some instances he doesn't.

Therefore, the burden of re-education rests with the innovators. People work best within the space configurations they are used to. At present, it would seem to me that the importance of this project is not to be measured in total treatment or production figures but rather in specific acceptance by the dental officer. This is something new and unique to him. The new physical design: excellent, the efficiency: remarkable, patient acceptance: splendid. But what about the operator? What are his compensations? Certainly this is a departure from the traditional. Why or why not should he accept or reject such an environment? How does the operator feel about it? How do the auxiliaries feel? Success or failure is measured here--at the stage of development.

New innovations affecting established patterns of behavior are often regarded with suspicion and rejected without a fair appraisal by the uninitiated. I think acceptance will eventually permit treatment to increase markedly and I believe you will be presented with production statistics to bear this thinking out!

Let's look back a few years and take Northwestern University Dental School as an example. We have a unique feature at this university. They had the "cubicle concept" in 1926. Many schools are just arriving at this concept--i.e.: Kentucky at Lexington. I might add that this concept was conceived and implemented by Dr. A. D. Black in 1926-1927 in the then new Ward Memorial Building. That was 41 years ago. This was accepted by students because they were "brought up" and trained in such an environment.

In my opinion, these are the things that are important in the Navy Radial configuration project.

1. It is in effect a convenient extension of the cubicle concepts.
2. It offers lower total expense if incorporated in a group practice.
3. It utilizes time and people most efficiently.
4. It meets possible demands of coming social changes.
5. It lends itself to training.
6. It is flexible.
7. It insures adequate treatment and protection of the operator and the patient.
8. It works best with utilization of Dental Assistant or 4-handed dentistry.

These are all important things.

The philosophy of such things as team concepts, four-handed dentistry, utilization of scarce manpower (especially if you project the population explosion of the seventies), efficient use of available productive time; is all fine! I believe the ultimate use of such a configuration may be subject to change. The occupation of these spaces at present, by a dentist, may be more fleeting that we care to admit. I am thinking of utilization of trained technicians to eventually operate in such spaces. To what possibilities do these spaces lend themselves?

1. Excellent supervision of technical assistants by the Dental Officer.
2. Convenience due to design and efficiency.
3. More and better diagnosis and treatment planning by the dentist and better treatment.
4. Built in quality control and discipline in dental service.
5. Hopefully less replacements of restorations, which could reduce total work load at least 50-65 percent.

The intensive practice of dentistry is very demanding. It develops singleness of purpose regarding the dental disciplines. The purposeful dentist must focus sharply on his work. His focus often shuts out other stimuli and helps develop a tunnel vision regarding dentistry. This is not entirely good, although it may be a pathway to financial success. I feel this may frequently interfere with the dentist's own growth toward professional maturity, may even stifle his relationship with his family and may isolate him from many useful activities. Certainly the delegation of many duties would alleviate some of these problems. It has worked in the medical profession. I feel these concepts we are discussing today will move dentistry in a forward direction.

What is the dentist? A product of his environment? Traditionally the dentist has been trained in one to one (1:1) concept. He has decided on dentistry because he thinks it will give him social stature and independence, affluence, personal satisfaction, and a myriad of other reasons. He is interested in income and in work simplification and quicker more effective ways to dispense better treatment. He is generally quite inflexible in his views and may resent people looking over his shoulder. He talks about total dental treatment but his horizon may be the single tooth, not the stomatognathic system and more realistically the total health of the patient. For these reasons I feel you must have a thorough program.

Let's look at a few of the problems in dentistry your space configuration eliminates.

1. You have given the dentist privacy but at the same time he is part of a team. He is not isolated and professionally lonely.
2. You in effect have given him a healthier environment to work in.
3. You have made him more efficient by utilization of auxiliary personnel.
4. You have broken with tradition.
5. You have designed equipment for use by dentists and not equipment that some manufacturer thinks a dentist should use.
6. You have motivated patients to demand dignity and to expect preventive and prepathogenic treatment.
7. The total work space should cause less stress on the dentist and his assistants.
8. Proper lighting, cleanliness, color, and personal comfort are built in along with climate control.

9. You have provided the dentist with the ability to offer total treatment through more efficient use of his time, his assistants' time, and the patient's time.

10. You have effectively placed in limbo such things as:

a. short appointments
b. limited treatment
c. pain during treatment
d. cross infection
e. perfunctory treatment
f. poor diagnosis and treatment planning

11. You have motivated the dentist by giving him a unique environment.

12. You have motivated the auxiliaries by giving them the identical unique environment and more meaningful participation in treatment.

13. You have set up good diagnostic methodology and treatment recording methodology.

14. You have prepackaged standard sterilized instrument kits and made materials available with the four-handed concept.

15. You have provided rest periods in relaxed surroundings.

16. You have made efficient use of the time of all those participating.

17. Central sterilization used to clean, sterilize and make up supplies and instrument kits.

18. You have programmed supplies, etc.

What does all this do? It should increase productive time--and it does! In my own case I found I worked for a conventional seven hours--pushing every minute I thought. I then found my total* "real time" was approximately 4 hours. This "poor spending" of a dentist's time more than ever convinced me for the need of technical auxilliaries.

I endeavored to increase my operating time and found I was able to do so--up to five hours "real time." I found that this amount of effort inevitably put me in an awkward position as far as work load was concerned. I tried to accomplish (due to the operating ease of the situation) more work than I could conveniently do. I had to push even harder to complete the restorations in cavity preparations I had prepared. This lead to some anxiety and frustration. I am sure a reduction in quality of work and morale could result if these symptoms were not rectified. Now I feel it is very important to program your production according to skill to avoid pressure, anxiety, and frustration.

This of course has an effect on the assistant working with you. Even with the convenient programming of supplies my effort was short of what I expected of myself. This problem I feel can be solved with more experience in the unit and more realistic programming of my production capabilities against my specific "real time" figures. I think the neophyte in such an environment needs explicit counseling on total time spent, versus real time, and productive goals.

* Real time is the actual time spent by the dentist working in the patient's mouth.

Otherwise, you get beyond yourself.

From the standpoint of human engineering, maximum comfort and convenience was the order of the day. I am sure this will increase life expectancy, as Capt. Lloyd Armstrong indicates, by 17%.

I feel that a dental assistant as well as the dentist must be trained specifically to work in this convenient environment. The lack of frustrations during the normal delivery of dental treatment may unleash other frustrations we are unaware of.

I would like to make comments on diagnosis, treatment planning, and instrument packaging.

I felt the system was good but constantly found myself wanting to re-examine the radiograph of the carious lesion for my own projection of cavity design. This proved frustrating. I would like radiographic interpretation available while I work on patients. I often wondered about apical pathology and frequently had to interrupt and review the radiographs.

Instruments are a personal thing. I adapted to the available instruments in the kit but found they did not afford me the opportunity to do my best work. I feel these should be available on an individual basis and programmed for each dental officer within limits.

I suffered not at all from boredom--but from the frustration of not properly pacing myself. I feel a study is necessary here.

I think the team concept is excellent and is here to stay. The leadership given to this program is exemplary and plaudits are deserved by those that implemented such a program. This project certainly can help educators determine the direction they want to move toward. You are insulated from many forces that would affect us if we were to institute such a program now.

The treatment recording methodology, by tape recorder, was unique and very successful. It occurs to me that utilization of a single clerk with the tapes and records gives splendid control. This is a very efficient system.

The efficiency of the entire evolution seems to be excellent.

I realize, too, that it must be difficult to make comparisons between conventional clinic and experimental clinic. There are many forces at work here. I would rely on observation, logic, and continuing results, and finally, statistics.

I would like to finalize this paper with some remarks from a paper by the late Dr. E. A. Hooten, who passed away in 1954--a physical anthropologist from Harvard. His words, written in 1934, haunt us:

"As a matter of fact, if I were asked in what occupations the United States indubitably leads

the world, I should reply without hesitation dentistry and plumbing." American dentists have reached a pitch of mechanical skill which is equal to that of American surgeons. But carpentry is not enough. Stopping teeth does not stop tooth decay. In the dental profession today are many brilliant scientific minds and many practitioners of consummate skill whose aims are humanitarian rather than pecuniary, but there are too few of such men and they have been insufficiently trained.

The dental profession has been for too long a time a neglected and disowned orphan child. While millions have been lavished upon medical schools and hospitals, and upon medical and surgical research, almost nothing has been allotted for these purposes to dentistry. Our schools of dentistry have been forced to struggle along without endowments; their teaching staffs have consisted almost entirely of devoted but unpaid men who give part of their time to teaching, but have to make their living in practice.

The prerequisites for adminission to dental schools have not been sufficiently high. In the past, many schools have admitted high school graduates to students with only one or two years of college preparation. This low standard of admission implies a supply of inferiorly educated men and a commercialized technical course, rather than the broad background of general education essential to the rigorous training of a professional school of medicine. As a result there has been very little scientific research in the dental school and what has been carried on has been principally commercial in its aim. The faculties of dental schools recognize these shortcomings and are striving to raise their standards and to transform dentistry from a trade to a profession, from a craft to a science. But they cannot succeed in any large measure until the public and the philanthropic foundations recognize the essential parity of dentistry with other branches of sciences.

I am well acquainted with only one dental school--that connected with an old and famous New England university. Like every other dental school, it has been regarded as a yellow dog trailing at the heels of the medical school. It has been slighted in endowment, in gifts for research, and generally neglected and half starved. Yet this dental school includes in its faculty some of the most enlightened, altruistic and scientifically minded teachers and research workers with whom I have been privileged to come into contact. It was first to lengthen its academic year to nine months; the first to require written examinations; the first to demand graduation from a high school as an entrance requirement; among the first to increase that requirement to two years of college.

This institution is now seeking an endowment which is absolutely necessary for its proper development. Let us not attempt to evade the issue. Either we must spend the necessary sums to give dental research and dental practice their proper status in the medical profession, or we must spend vastly larger amounts upon dental tinkers, whose unpleasant duty it is to lean over the dental chairs in which we sit, gaze upon the shocking vista of human degeneration which our open mouths present, and attempt the hopeless task of stopping decay and sepsis. I firmly believe that the health of humanity is at stake, and that, unless steps are taken to discover preventives of tooth infection and correctives of dental deformation, the course of human evolution will lead downward to "extinction."

This entire research project is leading us to brighter horizons in dentistry and better treatment for our patients.

"Reaction of Patients"

Lt. Paul Walker, DC, USNR

Introduction

The objective of this particular phase of the project was to determine the reactions of the patients when treated in dental offices arranged in a new clinical configuration, equipped with new equipment, and utilizing concepts of practice which few, if any, had had any exposure to previously.

Methods

The patients who were treated in the experimental and control clinics of the research area were, for the most part, recruits. The recruits were attached to the Recruit Training Command of the Great Lakes Naval Training Center and were undergoing various phases of the eight weeks of recruit training. These patients were scheduled for treatment in our experimental clinic and control clinic by the Recruit Dental Scheduling Office in order to meet our specific requirements. For example, ten dental officers working hourly appointments would require seventy patients per day plus two or three stand-by patients. In rare instances, when recruits were not available for treatment, personnel attached to the Administrative Command or the Service School Command were utilized. The information was collected from a 20% random sampling of the 1,417 patients treated during the 8 testing periods, by means of various forms which were employed at specific times during the patient's period of treatment.

The patients were asked to fill out these forms without any fear of criticism. There was a space provided for individual comments as to what aspects were liked or disliked. In order to insure the responses remained anonymous each patient was given an identification number as he checked in with the appointment clerk and both forms were identified by number only. During each of the eight testing periods, on a random sampling of days, all of the patients received a Patient Information Form, and were asked to complete it. It was given to them as they checked in with the appointment clerk at the front desk. We were then able to catalogue the patients according to: age, place of birth, amount of education, job experience, dental experience and any comments.

Also, during the eight testing periods on the same random sampling of days, all the patients who had received treatment were asked to complete a Patient Reaction Form. It asked questions regarding the relaxation or comfort of the patient before or during treatment, the length of the waiting period, the length of the treatment period, and the reactions to the treatment. The only response evaluated for this report is "The way you received dental treatment seemed excellent, good, fair, poor, or don't know."

Results

Information comparing patient response to treatment in the control clinic versus treatment in the experimental clinic has been evaluated. In addition, information on the patient response to treatment in the experimental clinic has been evaluated in regards to both the individual's education and previous dental experience. Finally, an evaluation of the patient responses was made separately by three dental officers, two of whom were attached to the Dental Research Institute and the third one to the Dental Department, Administrative Command.

Table 1 shows a comparison of the responses of the patients after treatment in the control clinic versus treatment in the experimental clinic. Although a slightly greater percentage of the patients rated the treatment on the control side excellent, both clinics appeared to be fairly similar. Seventy-nine percent on the experimental side rated the treatment excellent while 82% on the control side rated the treatment excellent.

Table 2 shows how 150 patients rated their treatment in the experimental clinic according to their prior dental experience. The "rare" group was composed to those who when questioned "How often have you been to a dentist?", either answered never or once. Those rated "occasional" were those who answered, once every few years or once a year. Those labeled "routine" were those who answered twice a year or more. It appears that with increasing dental experience, the response to treatment was more favorable. Sixty-two percent of those with "rare" dental experience rated their treatment excellent, while 73 percent of "occasional" dental experience, and 84 percent of those having had "routine" dental experience rated their dental treatment as "excellent."

Table 3 shows how the recruit patients rated their dental treatment according to their amount of education in years. Eighty percent of those patients with 8-12 years education rated their treatment as excellent as compared to 64 percent of those with 13-16+ years of education. In the 8-12 category, 95 percent rated their treatment as excellent or good as opposed to 90 percent of those with 13-16+ years of education.

Table 4 represents an evaluation by three dental officers of the response of 263 patients. The data shows 84% in the experimental clinic versus 77% in the control clinic being pleased. Ninety-seven percent in the experimental clinic being either pleased or satisfied versus 98% in the control being either pleased or satisfied.

Discussion

It appears that there is little difference in the patient response regarding treatment in the experimental clinic versus treatment in the control clinic. This suggests some flexibility on the patient's part for accepting the new clinical configuration, the new equipment, and

the concepts of operation such as the supine position for the patient, long appointments with comprehensive treatment accomplished, rubber dam application, absence of the cuspidor, and the aseptic technique. The patients appear to be able to tolerate and accept these procedures quite readily. It was surprising that with an increasing amount of education, the excellent rating of the dental treatment dropped from 80 percent to 64 percent. Upon evaluation of our questionnaire it was determined that instead of selecting those with more education, high school dropouts and college dropouts were also included in these positions. It might have been better to have grouped them as "less than 12"..."completed high school"..."some college"..."less than 16 years"...and "college graduates." It was not surprising, however, to learn that those with an increased amount of dental experience accepted the treatment and rated it excellent. There appears to be no vast difference in the patient's reaction and response to the experimental clinic when compared to the control clinic treatment although the latter more closely approached the standard of practice normally experienced.

Summary

In summary, there appeared to be no difficulty in the patient's acceptance or the treatment methods in the experimental clinic. The patients tolerated, accepted, and were not critical of the clinical configuration, the experimental equipment, or the concepts of practice.

Table 1

Questionnaire response in percent during various testing periods of 273 patients selected at random after treatment in the experimental and control clinics.

"The way you received dental treatment seemed..."	Experimental	Control	Both
..."Excellent."	79	82	80
..."Good."	16	16	16
..."Fair."	4	2	3
..."Poor."	1	-	0.5
..."Don't Know."	1	-	0.5

Table 2

Questionnaire response in percent during various testing periods of 150 patients selected at random after treatment in the experimental clinic according to previous dental experience.

"The way you received dental treatment seemed.."	Prior Dental Experience		
	Rare	Occasional	Routine
..."Excellent."	62.5	73	84
..."Good."	12.5	21	14
..."Fair."	12.5	4	2
..."Poor."	----	1	-
..."Don't Know."	12.5	-	-

Table 3

Questionnaire responses in percent during various testing period of 150 patients selected at random after treatment in the experimental clinic according to years of education

"The way you received dental treatment seemed..	Years of Education 8-12	13-16+
... Excellent."	80	64
... Good."	15	26
... Fair."	2	10
... Poor."	1	-
... Don't Know."	2	-

Table 4

Evaluation in percent of 263 Patient Questionnaire Responses as evaluated by 3 dental officers

	Research Clinics		
	Experimental	Control	Both
Pleased	84	77	81
Satisfied	13	21	16
Dissatisfied	3	2	3

PARTICIPANTS AND STUDY GROUP ASSIGNMENTS

Participants

Rear Admiral Frank M. Kyes, DC, USN
Rear Admiral Maurice E. Simpson, DC, USN

Study Group I

Chairman -- Richard D'Vincent
Myron G. Turner
George Rader
Charles M. Heck
George L. Cermak
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Study Group IV

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Frank Grossman
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Joseph J. Jacobs
Carl E. Erickson

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Consultant-- Gordon H. Rovelstad

REPORT OF WORKSHOP I "PROJECT EVALUATION"

Topic of Study Group I

"The design and layout of dental operatories and the supporting spaces of the experimental clinic."

General Charge: To provide an interpretation of the design of the dental operatory and dental clinic design demonstrated in this project when compared to conventional designs in regard to how well it meets the stated objectives of the project (efficiency, versatility, reduced stress and strain, and asepsis). The group is requested to keep in mind that the major objective of the changes introduced is to provide a better service for the patient.

Report of Study Group I

Concept

Concerning the basic general concept of the experimental clinic the idea of having a central supply area and a rotator technician to provide needed materials appeared excellent.

Also, we felt that a centralized area for cleaning, sterilizing, and storage of instruments was excellent.

Experimental Design

With reference to experimental design of the clinic the following were accepted without question:

1. The traffic pattern separated the patients' area from the staff area. This allowed patients to come from behind the module while the staff entered from the center which is good.

2. The size of the operatories in the experimental clinic is adequate for operative dentistry - with 5 DORs to a single rotator.

3. The centralized scrub area is properly positioned.

4. The partitions around the DORs afforded adequate privacy for dental patients and operating teams.

We felt that the following minor changes in design were indicated:

1. In the CSR the storage area of the packs should be directly available to the rotator technician.

2. Also in the CSR, contaminated material brought in for cleaning should be separated from the area in which material was sterilized.

3. With respect to supporting areas, a few additions appear to be indicated: i. e. an administrative office , a recovery room, and doctor's consultation room.

With respect to the stated objectives of the project, namely: efficiency, reduced stress and strain, asepsis, and versatility, the group believes that the experimental design does reduce stress and strain, increases efficiency, and supports asepsis. With modification, and suggested as a subject for further study, a complete dental service appears possible and indicated. The existing concept is sufficiently versatile to meet the needs of most dental services.

As to the arrangement of the experimental DORs, the group's reaction generally was favorable. However, while it was clear that this arrangement is superior to the conventional design, it was felt that other configurations should be considered before a decision is reached on a recommended arrangement.

Discussion

Capt. Ludwick: Did your group have any other ideas about design?

Capt. D'Vincent: We haven't gotten into that part of it, Captain Ludwick. We looked ahead into the afternoon's venture, "Project for the Future", and that's the very first question -- Do you like "today", and if you do, do you like something else better, -- if so, what? That sort of thing. This is going to be a monstrous project.

Capt. Rovelstad: Any other comments? If there are no objections, this report is accepted.

Topic of Study Group II

"The selection, arrangement and placement of equipment in the experimental clinic".

General Charge: To provide an interpretation of the selected equipment, its capability, location and organization in this project when compared to conventional equipment as to how well it meets the stated objectives of the project (efficiency, versalitily, reduced stress and strain, and asepsis). The group is requested to keep in mind that equipment was developed for the project to support the major objectives without regard for whether it was commercially available or not.

Report of Study Group II

We were asked to evaluate the selection, arrangement and placement of equipment in the experimental clinic. This was done within a very narrow context, really, and properly so. We considered only the specific items of equipment as they exist today in the experimental clinic and as how they relate to each other within the concept practiced in the experimental clinic. We feel that there is incomplete data available at this time to completely evaluate this equipment. Some of the questions posed were:

1. Does the equipment selected allow for the proper positioning of the patient? Explain.

The selection, arrangement, and placement of equipment in the experimental clinic does allow for proper positioning of the patient. However, it does not allow for proper positioning of the head for certain complicated oral surgical procedures or prosthetics, particularly dentures. It is recommended that a convertible head rest might be used which is fully adjustable. A lower type chair base is recommended for less operator and assistant stress during certain mandibular restorative procedures.

2. Does the equipment selected allow for the proper positioning of the operator? Explain.

This equipment allows for the proper positioning of the operator. However, it must have provision for a quick-connect box on the right-handside for the left-handed operator.

3. Does the equipment selected allow for the proper positioning of the assistant? Explain.

The equipment does allow for the proper positioning of the assistant.

4. Are the required services provided to the dental operating room efficiently? (air, water, electricity, suction).

All of the services such as air, water, electricity and suction are provided efficiently.

5. Does the compact unit substantially fulfill the requirements for patient treatment?

The compact unit substantially fulfills the requirements for patient treatment with the previous qualifications.

6. Does placing the compact quick-connect box in a fixed position relative to the oral cavity provide for maximum efficiency?

The quick-connect box in the fixed connection provides for maximum efficiency.

7. Are dental operating trays adequate? Properly positioned?

Yes, but the "golden arm" cervical tray could have an added simple vertical capability, such as the operation of the Weber-P-64.

8. Does the method of recording treatment appear to be satisfactory?

We had more discussion on this than on any other item. There are a lot of pros and cons on this, and there were quite strong feelings about this. On the whole, it is an excellent way of recording this treatment, it has the work done outside the operatory. I'm not too concerned about the fomite potential of having the record in the office, I think this has been over exaggerated. There seemed to be some concern on the part of the group as to whether or not there would be errors creeping in, and I think possibly errors might creep in, in transcription, but you have errors creeping into our present system, as we all know. So the consensus was that yes, it is a good system, however we do feel in this same connection that the operator should have immediately available the dental record and any radiographs of the patient. We don't feel that he should be so separated physically from the radiograph and from the dental record, which he is at the present time.

9. Does the equipment selected fulfill the requirements of asepsis, versatility, reduced stress and efficiency?

Yes, we concluded that it did.

Recommendations

1. The rotator stand should be improved. Available data indicates it is not completely satisfactory. We feel you can improve this piece of equipment as it exists today, under the present concept.

2. Energy should be devoted to the development of an autoclavable tubing or hose. We feel that this should be done rather than dismantling the whole lashup, autoclaving the handpieces -- gas sterilizing the hoses.

Summary

We believe that this equipment as arranged in the experimental clinic under this concept has sufficient potential to warrant further development. To put it into a nutshell we think you are on the right track, but there is not enough data and there are too many variables to prove that this is the ultimate equipment.

Discussion

Cdr. Hickey: Should we have a chair base that goes lower to obviate tipping the chair back so far. If the dentist has to operate with his arms up in the air, this is a stress factor. I believe Den-Tal-Ez makes one and you may have had one in your clinic.

Editor's note: No low base was used.

Capt. Nealon: We should wait for the recommendations of the second phase of this workshop. We are viewing this only as it exists today. There are a few sidelights, however, for example if you were to take off your manifold quick-connect box and substitute the Weber P-64, you'd find out you couldn't operate with it because of the swing arm of the Weber. By the time you get the patient tipped back so that his head is in your lap, his feet and legs are so high that you can't use the swing arm of the Weber. But this doesn't fall within our immediate province right now. We are commenting on this equipment as it exists today.

Capt. Middleton: I'd like to hear why this group believes that this particular configuration could not be used for exodontia or oral surgery procedures.

Capt. Nealon: We feel it can be used for exodontia, but we don't feel it can be used for oral surgery.

Capt. Middleton: Well what is the oral surgery?

Capt. Nealon: Well, let me call on my expert, Art Turville, the oral surgeon.

Capt. Turville: We didn't feel that we could adapt this to more complicated oral surgical procedures, with the exception of exodontia which was acceptable.

Capt. Nealon: Yes, that's an answer, I don't know whether its satisfactory or not.

Dr. Kolbe: (Dental Officer, USNR, on two weeks duty) I just would like to add, I've used this particular chair--now I don't work for Den-Tal-Ez -- but I've used this particular chair for seven years and the argument of surgery, I think has some merit, although they have adapted it with a headrest which does hold the head more stable and this is part of the problem in surgery I've found. In prosthetics by tipping the patient back the tongue drops back, this is part of the feature of the chair, so that it blocks the throat and the patient does not gag. The idea of not putting the patients head all the way back is wrong, the way I've interpreted it and maybe I'm a victim of the manufacturer, I'm just throwing this out for what its worth, but I've had impressions on myself taken in the chair and it hasn't gagged me. I take some myself, I feel that my visibility is better by taking impressions in the chair and having the patient's head way back, than having the patient sitting up.

Capt. Nealon: I guess this is a matter of opinion more than anything else. Our group felt that while its admirable for crown and bridge work, and incidentally as an added note we have a Den-Tal-Ez chair with the new low base under user test down at NAS Jacksonville, and one of the disadvantages we found in the conventional headrest was the fact that it has a very limited excursion. If you get a rather short patient in the chair you can't get that conventional headrest

down in position. With a contour type headrest for crown and bridge -- yes. Its now in the prosthetic department for evaluation -- but the prosthodontists we had in our group felt this was not the ideal chair for denture prosthesis.

Capt. Rovelstad: Are there any other comments? If there are no objections this report is accepted. Its rather interesting that the most frequent comment that we have received from visitors is that there was no cuspidor on the unit and yet this wasn't even commented upon by any member of this workshop session. Apparently this is an obsolete item.

Topic of Study Group III

"The personnel, staffing and utilization of personnel."

General Charge: To provide an interpretation of the personnel staffing the experimental clinic and their assigned duties in relation to meeting the general objectives of providing a better service to more patients more efficiently without cross-contamination. Comparison to current staffing practices of conventional clinics should be considered as well as new proposals on the use of auxilliary personnel.

Report of Study Group III

At the outset, the study group accepted the premise that enlisted personnel are presently available to adequately staff similar experimental design clinics and that the disciplines of Operative Dentistry only are under consideration.

It was agreed unanimously that the concept of better dentistry, to more people, in a more efficient manner and without cross-contamination is completely worthy of support by necessary personnel.

Current staffing practices unfortunately are inadequate. The ratio of 1.75 to 1 is unrealistic. The manning level of 81% is devastating. Certainly the new proposals on use of auxiliary personnel are realistic and in concert with the modern trends in dentistry.

1. Does the assignment of five dental officers to five dental operating rooms with a supporting team of seven dental technicians represent an efficient use of personnel? Explain.

Assuming the diagnosis, treatment planning, radiography, appointment desk procedures, etc. are available and adequate to maintain an orderly flow of patients to the clinic, the ratio of 5 DOs to 7DTs is an efficient use of personnel, and such was well demonstrated yesterday during our visit to an operating session.

2. Should more or less personnel have been assigned to the five-chair suite?

As mentioned in 1 above the number of personnel are adequate. The study group would gratefully entertain any suggestions on the possible use of less personnel.

3. Was it necessary for the appointment clerk and the supply room attendant to be trained dental technicians?

Supply room and appointment attendants need not be trained dental technicians; however, it is preferred that they be so trained. Civilian counter-parts are presently being utilized in these capacities with apparent success.

4. Was the assignment of full time chair-side assistance necessary?

Yes, four hands are necessary. The assignment of fulltime chairside assistance is definitely necessary for four-handed dentistry. It is hoped that current international commitments will soon allow us to return to adequate staffing.

5. Would you recommend a special rate or designator, such as "Dental Surgery Assistant," for all chair-side assistants, the rotator and the sterilizing room personnel? Pro-pay?

Regarding special rates, designators NJC, etc. - if this type of program becomes accepted Navy-wide and in sufficient numbers to justify this very involved and difficult change, the study group would recommend such changes for the CSR and Rotator Technicians. The present designator is adequate for the chairside assistants. Although not specifically charged with pro-pay consideration, the study group is strongly in favor of any monetary recognition of talent and training which would obviate the necessity of any Bluejacket to moonlight.

6. Was the assignment of one rotating assistant to deliver supplies to five different dental operating rooms adequate?

The assignment of one (1) Rotating Assistant was adequate. However, it seemed apparent that his responsibilities were inordinately heavy. Some innovations to lighten these burdens, other than with additional personnel, may be possible - for example: some engineering advances in material handling may be developed such as premeasured alloy and mercury capsules, cavity liner, surrette-type applicators, etc. Perhaps chairside amalgam preparation could be permitted.

7. Did the use of personnel in this study provide a proper approach to expanded use of auxiliaries? Explain.

Under this present study, our group did not feel that this was a proper approach to the expanded use of auxiliaries. It was felt that chairside assistants could not be involved in some reversible procedures such as matrix and rubberdam application etc.

In conclusion, and with particular attention to the personnel involved, our study group was unanimous in its concern for just how well this program was accepted by the dental officers.

The data presented and our visit to the operating session, indicate a happy situation for the CSR Technician, Rotator, and the unusually fine team feeling of the chairside assistant. However, the data presented did not convince us of a happy dental officer. We are not sure if one would like to do this, eight hours a day -- every day -- for twenty years. A more concerted survey of dental officers in like groups should be made.

Discussion:

Capt. Moore: We all agree this has been most stimulating and thought provoking. I've never seen anything so well organized in my life.

Capt. Grossman: Pro-pay is sort of a never-never land. Why moonlight? I suppose someone might want a new Corvette, or possibly a man married early and has five or six kids -- this sort of thing. What is the point of putting in a recommendation for pro-pay so that they won't have to moonlight?

Capt. Moore: Moonlighting may be necessary today to support the family of the dental technician. It is not a critical rate. We would favor anything that would recognize, in a monetary way, training and talent.

Col. Christopher: Would we consider an especially trained dental technician adequate for the central sterilization room technician or would we want someone with an MOS number such as the Army has?

Capt. Moore: We have a Navy Job Code that we use --- we may have to send a man to sea. CSR training could be incorporated into the curriculum of the Navy Dental Technician School, also on the job training.

Capt. Rovelstad: If there are no objections, this report is accepted.

Topic of Study Group IV

"Clinical routines; patient handling technics, instrument handling techniques and, aseptic techniques."

General Charge: To provide an interpretation of the procedures introduced in the experimental clinic to meet the objectives of the project (efficiency, versatility, reduced stress and strain and, asepsis) in relation to conventional methods. Special attention should be given to the methods employed to prevent cross-contamination between patients as well as between patients and staff personnel.

Report of Study Group IV

1. What is your evaluation of short appointments versus long appointments in this study?

The longer appointments were more productive, in surfaces filled, in both the experimental and control groups. Our group felt that longer appointments may restrict the treatment of larger numbers of patients.

2. Do instrument handling techniques satisfy aseptic requirements?

Yes, the concept does satisfy aseptic requirements. This group recommends that instruments having joints be placed in an ultrasonic bath containing a lubricating substance to prevent these instruments from "freezing."

3. Did the pack method of supplying instruments appear to be efficient?

The pack method of supplying instruments appears to be efficient. It is noted that the initial investment may be greater but eventual instrument loss and breakage should be drastically reduced and commensurate savings should accrue. It was also noted that the instruments in the packs were of high quality stainless steel and double-ended. These features are highly recommended for use in this concept. High quality stainless steel will hold up under constant autoclaving and consequently, return a savings over the years. Double-ended instruments are usually less expensive to purchase than two single instruments and a savings in initial investment would result.

4. Did routines allow all forms of treatment in the same operatory?

For the purpose of this study, there was insufficient time to evaluate all forms of treatment in the same operatory. Consequently, it was not shown whether all forms of treatment, in fact, could be done in a single operatory. It appeared to this group that all clinical disciplines, with the possible exception of prosthodontics, could be done in these operatories but, further testing is advised.

5. Were methods of sterilization sound?

The methods of sterilization on the experimental side were outstanding and far superior to those methods used on the control side. The group recommends that the orderly progression of instruments should allow for the following tasks to be performed in the central sterilization room:

a. Scrubbing of instruments
b. Ultrasonic cleansing
c. Wrapping of instruments in packs
d. Autoclaving packs

Storage of autoclaved instruments in a convenient location such as in two-way cabinets so that the rotating technician can efficiently remove the sterile packs from his side of the CSR bulkhead while the CSR technician can load the cabinets from the CSR side of the bulkhead is recommended. It was further recommended that the location of the CSR be placed for more efficient usage.

6. Was the practice of wearing gloves, caps, masks and gowns satisfactory in meeting the requirements of asepsis in a dental operatory?

This concept would more than meet the requirements of asepsis in a dental operatory. This group, however, questioned whether this routine would be too cumbersome, costly and inefficient to meet the requirements of preventing cross-contamination and at the same time remain mission oriented throughout the Navy. This group recommends that the minimum asepsis should be to eliminate cross-contamination from patient to patient. Without scientific basis and until the facts are known, this group recommends the following minimum precautions to prevent cross-contamination:

a. All instruments should be placed in packs and sterilized.

b. The hands of the operator and technician should be gloved or thoroughly scrubbed between each patient.

c. Masks should be worn by the operator and technician.

d. Patient's hair should be capped or draped to isolate the hair from the field.

e. Rubber dam should be used for all operative dentistry procedures.

Additional precautions which may be considered are:

f. Pre-operative oral rinse to reduce bacterial contamination in the aerosol.

g. Fascial preparation with a sponge containing an alcohol-iodine preparation.

7. Do you feel that the routines employed prevent cross-contamination?

Yes, in concept, but whenever other dental procedures, other than restorative dentistry under rubber dam, are performed, aerosol contamination will be a greater problem than contact contamination. The circulators supply stand is a probably source of cross-contamination of patients. Aerosol drop-out during the day constantly contaminates the shelves and items on them. Transfer of these materials to operating trays presents a hazard. Elimination of this source of infectious agents is an important requirement in overall asepsis of the experimental clinic. Patient handling techniques: There was a professional atmosphere demonstrated throughout the experimental section, but de-personalization was apparent. No communication was observed between the operators and patients.

Summary

Although more sophisticated methods of work sampling techniques are desirable, the validity of short versus long appointments in operative dentistry in this study can be resolved, for the experimental clinic, if you are willing to accept that there was a 35% increase in surfaces restored in a unit time.

However, this is possibly offset by a 40% increase in auxilliary personnel required. There also appears to be a critical number of patients that can be programmed per day. In accordance with data presented, it is 25/day or five per dentist. To increase the number of patients per day with short or hourly appointments for other treatment procedures such as oral surgery, periodontics, endodontics, etc., would require an additional 40% increase in auxiliary personnel (or an overall increase of 80%.)

We may all agree that this appears to be a more ideal practice approach; however, a practical justification for this concept would be a determination of cost effectiveness.

Discussion

Capt. Moore: At what stage do we sharpen instruments? I'd like to suggest that after they are sonically cleaned.

Capt. Heck: What do you mean by a 40% increase in personnel?

Capt. Ludwick: It depends upon how you calculate it.

Capt. Grossman: In the control clinic there were five dental technicians and in the experimental clinic there were seven dental technicians, -- that's a 40% increase in auxiliary personnel.

Capt. Armstrong: We feel that it is more realistic to consider the entire team concept and total personnel involved rather than to break it down into rates, or rank, or even jobs. The control clinic had five dentists and five dental technicians for a total of ten, the experimental clinic had five dentists and seven dental technicians for a total of twelve, -- that's a 20% increase in total personnel.

Capt. Grossman: This is a good concept, and I should elaborate on the factor of cost effectiveness. This is the determining factor in relation to what is being done and how much it costs. Certainly this is a team concept and this is how you would determine the cost effectiveness in relation to the utilization of a dental officer's time in what he can do. In the data that was presented it appeared, at least to me, that you could offset the control clinic and the people that were supported and the amount of work that was accomplished in unit time, with the increased personnel etc., in what was accomplished in a unit time. From a cost effectiveness basis, if you could balance these two out and show they cost equally as much certainly then you could more adequately justify a more ideal team approach such as you are presenting.

Capt. Nealon: I am alarmed about double-ended instruments. There are many cases on record where the assistant has inadvertently been harmed by the exposed opposite end of the cutting instrument. This is especially true of sharp bladed instruments. This is for your consideration.

Capt. Ludwick: I'd like to go back to this business of 20% versus 40%. I'll ask Lloyd, Ted, and Frank to form a committee and report on this, also Lou (Wachtel).

Cdr. Wachtel: If you are sure to say auxiliary personnel, then 40% is right.

Col. Christopher: What was eliminated from the gowning and gloving technique?

Capt. Ludwick: We didn't eliminate anything but added covering the patient's hair.

Editor's Note: The operating team's sterile gowns and head cover were eliminated.

Capt. Heck: I think figures on cost effectiveness would be startling. You have thrown out $1,000 for cabinetry, $1,800 for a fixed unit, and if we were to use the Veteran's Administration's standard fee schedule of $4.00 to $5.00 per surface, a 35% increase in surfaces would more than offset the cost of a 40% increase in auxiliary personnel. I would also like to add that proper use of double-ended instruments precludes injury to a dentist or assistant.

Capt. Rovelstad: If there are no objections this report is accepted.

General Discussion on Workshop I

Admiral Kyes: How many gowns were worn each day? One for each patient or one all day?

Capt. Rovelstad: For maximum asepsis -- one for each patient. However, this was not the system that was always used.

Col. Dybowski: There is one thing that is not established. Is this the end of such studies or do we wish as a group for them to continue for another year to come up with more data?

Capt. Grossman: According to study group #4, this would have to be an on-going thing to determine cost effectiveness. Most people feel that it should be an on-going thing.

Capt. Hunley: There is a need for further study on the aerosol problem which is more justification for continuation of the study. The areas of endodontics, prosthodontics, periodontics, and oral surgery need to be performed in the operatories in order to determine feasibility. Therefore, further studies are needed. There is great need for continuation.

Capt. Nealon: We are convinced that there should be further study on equipment and design. There are many unanswered questions. One of them is: Is this particular configuration as used today, in this experimental clinic, adaptable Navy wide? The average is 3.9 DORs per activity. Is this applicable to this, a small activity? I think that there are so many unanswered questions here that they have to be pursued further, definitely. This chair manifold is a tremendous step in the right direction. We all know, we don't need this "tree" or "gasoline pump" (unit) to support cutting instruments and a few other things. Yes, I think this should be an on-going program. We haven't gotten our answers yet.

Capt. Turville: I just question the validity of the use of this information we have in relation to our officers who are spread throughout the Navy. Shouldn't we have (let's say) more experienced officers evaluating this equipment and this concept (that we're after) rather than the young man who has just come out of school and has no military background whatsoever. He hasn't been aboard ship, he hasn't been in other situations. I question whether he is the best evaluator. None of us have had an opportunity to use this equipment, obviously. We can't properly evaluate it from a rather brief observation. I wish the questions presented could have given us more time.

Capt. Heck: I'm very happy that someone mentioned the word "ship." We do have a lot of dental activities afloat. Every time we change from one outmoded "tree", to another it means piercing a deck, running lines, etc.

Unfortunately, our latest ship, to be commissioned this coming fall, will have a fixed unit to which its dental officers will be wedded for the next 20 years. Because the operating rooms are over computer equipment and electronic equipment, it isn't possible to get up under the deck without moving hundreds of thousands of dollars worth of highly specialized electronic gear. The concept that Lloyd has brought forth here is something that must be considered for the entire Navy. The costs of ship construction, today, are fantastic and they are mounting each day. The cost of just modifying the Saratoga's dental spaces was given at 72 thousand dollars. It is extremely high. I feel that it is very important to continue studies in developing the applicability of this concept afloat. It should not be necessary to pierce decks and run power and plumbing lines beneath the decks to keep it contained within the operatory. The oral evacuation, could be within deck levels through a bulkhead mounted supply box such as Lloyd has located in the deck. This could be done on a bulkhead!

Once your supplies are in this area the exact type of instrument package or control box can be modified. This study may not be the end, but it certainly is the beginning. This is the direction in which we have to move and I haven't heard of anything better than this, elsewhere. I would strongly suggest that we continue this, from the point of view of its adaptation afloat, as well as ashore, and also prove its versatility in the practice of prosthodontics, oral surgery and other specialities.

Capt. Rovelstad: You recognize that if equipment goes into the bulkhead there are hoses, lying across the deck and in the way of personnel. Of course, there is the possibility that the hoses can come down from the top.

REPORT OF WORKSHIP II

FUTURE NEEDS OF THE NAVY DENTAL CORPS

Topic of Study Group I

"The design and layout of dental operatories and dental clinics."

General Charge: To provide general recommendations for the design and layout of future naval dental operatories and dental clinics. Dimensions, organization, and location of supporting spaces should be considered in relation to staffing and treatment requirements.

Report of Study Group I

Centralization of Services

The concept of centralization of services and functional relationships should be standardized as much as possible. We recommend that the cleaning, processing, sterilization, and storage of dental instruments be centralized. An area for scrubbing, gowning, and gloving should also be provided as centrally as possible.

Configuration of Construction

The configuration of construction cannot be standardized because of unpredictable factors such as dimensional limitations and types of spaces provided. A more effective use of auxiliary personnel, however, is obtained by placing the rotator in the center of a circular configuration. Visual contact by the rotator is thus maintained, and patients still have a sense of privacy. A circular configuration requires a trapezoidal Dental Operating Room. The trapezoidal shape is recommended for the operative module. Further studies will be required to ascertain if this shape can also be applied to other specialties.

It is recommended that dental operating suites should consist of 5 DORs or multiples of 5 wherever possible. The minimal size of the DOR should be 75 sq. ft. for the purposes of asepsis it would be desirable to separate patients and staff personnel outside the actual dental operatory.

Miscellaneous

Wherever possible areas for the comfort of personnel should be provided. It is further recommended that future implementation of the experimental concept should procede at activities with varying missions, such as a training center, an air station, a port facility, and in a ship.

Discussion

Capt. Grossman: Why did you use the cluster of 5 as a basic Configuration?

Capt. D'Vincent: There was quite a considerable amount of discussion concerning this, as a matter of fact. We think in terms of four if necessary. In the Orlando plans we had to settle on four. We thought that one rotating assistant could be of greater service if he had more operatories to attend. There was some speculation as to whether he could attend properly 8 or 10 operatories? There is nothing to demonstrate to us that he could do this! That he could satisfy the requirements, (i.e., one rotator the requirements of 10 operatories). This remains to be seen, of course. If in some future construction where you would have 5 and 5 facing one another (as suggested, I believe, in one of the books here) maybe it could be demonstrated at that time. Right now 5 seems to be working rather well. Another factor: what happens if you only have 3 or 4 dentists at an activity? Then what do you do?

It could well be that you will still want 5 operatories and use these additional trapezoidal DORs for whatever we deemed necessary at that time. This was not an easy figure to determine however. We were certainly guided by this fine operation here, where they were successfully using 5.

We couldn't see any reason, off hand, to depart too far from that figure.

Capt. Rovelstad: Any other questions?

Capt. Grossman: Dick, don't you think your committee would be in order to recommend something?

Capt. Rovelstad: Do you recommend that the next 35 dental clinics follow this configuration?

Capt. Grossman: I recommend that the next 5 follow the configuration along these lines.

Capt. D'Vincent: This is going to be a little difficult to accomplish in the next 5 construction projects, with the amount of momentum that the planning has already taken here. And that, while we're very anxious, (I speak on behalf of myself here) to get this into new construction, I'm not sure that that's possible.

R. Adm. Kyes: You know one thing that sort of parallels this line of thinking would be, possibly, to get people's views. We could put an open bay in some clinics, more the type that Bill Ludwick worked in. Without changing the whole configuration of these clinics, we could put in an open bay somewhat similar to this one that might be amenable to some sort of use.

Capt. D'Vincent: Parallel to your suggestion, Admiral, rather than entering new construction, perhaps this configuration should go into some of our existing dental clinics.

Capt. Urban: I was just going to suggest that inasmuch as the Orlando clinic will be temporary for approximately one or two years, why not try this deal out there?

Capt. D'Vincent: Well...

Capt. Urban: And in effect, just take the one project rather than tie yourself up for 4 or 5 construction projects...

Capt. D'Vincent: I appreciate that, and its interesting that you should bring that up. We have developed the plans for our clinic down there, Captain Urban. I did this 4 or 5 months ago. And we did incorporate this in. We were

given a room a little too narrow to do a carbon copy of what they have here but, I was able to get in 4 trapezoidal DORs, a pair of them. Four here and 4 (gesturing) here following exactly in the footsteps here, as much as possible. This is one of those occasions where I say I don't think we will ever be able to rubber stamp a standardized trapezoidal module and say this is going to go into Miramar, the same thing, exactly is going into Pearl Harbor, or something like that. We can't do it quite like that. Each new site will offer its own new problems and have to be solved on their own merits. But we are going forward with this and it hasn't gained OSD approval yet. We don't think we will have any trouble in getting this one constructed down in Orlando.

Everything, right now, looks favorable. I have the plans for it right here, (incidentally) in case somebody is interested in seeing them. It is pretty interesting.

Capt. Mazzarella: Could I say a word? Some of us on the West Coast work closely with public health. They are going along similar lines. For instance, they have wall to wall lighting, the entire overhead is illuminated. There are no shadows in this room at all. I think you should be a little flexible when we can pick up bits of information for you; you should have a way to feed it into your next experimental clinic. As far as the trapezoidal room is concerned, Lou Wachtel and I measured with a scale, the other night. This trapezoidal arrangement does use a lot more space than conventional cubicles. Now there is a group at NIH who have the same type of approach, a CSR Rotator, but instead of this rotator working out from a central pivot point he walks a "U", he walks around a "U" with a feed-off point on shelves at the head of the patients. The patients' heads face each other instead of the feet. I'm concerned with our aerosols. I think this design is a better way to direct aerosol away from each patient: directs it away from the central rotator. I think you should consider this type of design. Especially your talking about where you're cramped for space. This type of design where you have three cubicles on either side of a central repository would use less space than your trapezoidal clinic.

Capt. D'Vincent: I would agree that we have to maintain considerable degree of flexibility here as modern technological advances come along. It certainly is good for us to inform each other across the country. Public Health is also proceeding rather fast on the East Coast too. Some of us have had an opportunity to get down to Louisville to see what's going on down there. This is startling. They're changing their minds. Nothing has really been settled in their minds yet. This lighting concept is of considerable interest. Bob Middleton has been talking about the fibre optics work that's going on out in his hospital there. This looks very exciting; it is promising in industry, as well. No, we aren't standardizing more, and I thank you for reemphasizing the point.

Capt. Middleton: One other thought. If you're going to consider several clinics making use of this experimental design, today you can come up with something that looks very good, but tomorrow and the next day there'll be changes in the position of the patient, or more concern for the aerosols than we believe today, and so you change your whole concept. A month from now when you plan the second one you'll have more information and want to change it. One of the things that came out in our discussion (and I'm sure it did in all groups) is the variability of practice depending upon the activity in which you are located. And if we were to have three such clinics, they should all be in three different kinds of Naval activities. You have one in a training center. Now let's have one at an air station, then one on a hospital compound. I think we'd learn a great deal because of the scheduling of patients (and) the type of work that's to be done.

Capt. D'Vincent: That's a good suggestion, whether it falls in new construction or modification of existing construction.

Capt. Middleton: That's the way to do it ... The next time your're building. . .

Capt. D'Vincent: Yes, I think that could be easily framed in here as a logical suggestion. I..., Dr. Christopher has a...

Capt. Rovelstad: Dr. Christopher?

Col. Christopher: No, Dick, I wanted you to tell them about what we discussed on beefing-up that center room to accommodate all the specialties and having the dental officers utilizing that room from time to time. We considered the problem of having a Base that, perhaps, only authorized four dental officers or even less. And in answer to Dr. Grossman's question "Why did we stick with the 5?", we thought that this 5 took best advantage of the hub with the rotator in the middle and in a small station where you wanted all the specialties to be practiced, we could beef-up the center room. Perhaps have it a little larger, add a little equipment in there that the prosthodontist would like, perhaps give the oral surgeon a little more room where he could do an occasional apicoectomy or this complicated procedure that he feels may be a little cramped in this present configuration. And then have the two operatories on either side or the beefed-up room just the way it is now. And this way (this was some of the thinking that went behind our decision to stay with this 5), we think this 5 is an ideal number and that you could practice all the specialties of dentistry, where you would schedule your patients that required the other specialties for this center room--not necessarily using it all the time. And then again, for some of these smaller stations we could always label one of these chairs an oral hygiene treatment room. We could call it a reserve chair for people coming on active duty, mobilization expansion, this sort of thing. We felt that we could justify this 5-chair module,

this concept, as a minimum.

Capt. Rovelstad: Are there any more comments or recommendations? Would the group like to add this (Dr. Middleton's suggestion) to the recommendation? Is there any objection? (None).

Topic of Study Group II

"Equipment requirements of future dental operatories."

General Charge: To provide general recommendations for the equipment to be installed in future dental operatories. Location and use of equipment should be considered as well as capability and durability.

Report of Study Group II

1. What type of unit installation is recommended?

We recommend no unit per se be installed; that experimental chair-mounted manifold concept be further developed to provide capability for left-handed operators and adjustable cervical tray. Also an evacuator cup be provided.

2. Do you recommend that patients be placed in a supine position for most procedures?

The chair should have the capability of placing the patient in the desired position. How he wants to approach the operating field depends on the individual requirements of the operator.

3. Do you recommend that the operator and assistant should be seated for most procedures?

To put it succinctly, YES. The capability, but it should not be compulsory. Sitting down, there is less stress and strain.

4. Do you recommend that equipment and utilities should be programmed in relation to the operating field on the dental operating chair? Explain.

The chair-mounted manifold places instruments where you want them. Yes. In addition, it is recommended the feasibility of tying into the bulkhead near the deck be investigated to obviate piercing concrete or steel decks.

5. Do you recommend that specialized equipment (Cavitron etc.) be permanently fixed in dental operating rooms? Explain.

No It is felt that special capabilities can be provided by prepared tray or mobile equipment.

6. Do you recommend that all equipment employed should support the concept of the aseptic practice of dentistry?

We recommend that all equipment employed should be adaptable to support the concepts of feasible asepsis. I don't know how far we want to go with asepsis, but I think the equipment should have the adaptability so that at some future time it would not be obsolete.

Discussion

Capt. Armstrong: Gene, one of the problems that we have with the dental unit or programming the facilities, such as a handpiece or an air-water syringe, is sterilization. I'm thinking not only of sterilization of the actual handpiece itself but sterilization of the rubber tubing material. I know that in hospitals, for example, they do sterilize rubber tubing if it's contaminated. If we should decide that handpieces and hoses should be sterilized, we know right now that the method of sterilization is not particularly feasible because it has to run through a gas-clave that takes about 5 hours. The reason for that is because rubber tubing presently available will not withstand auto-claving temperatures.

Do you feel, that a concrete effort should be made to develop or have developed a usable hose material that would conduct water and air to our instruments and that could be very easily auto-claved along with the rest of our instruments?

Capt. Nealon: As we recommended in workshop # I, the development of autoclavable hoses and tubing is necessary. I think this is paramount! I think this has to be done. I don't think it's insurmountable. I think if you have the money and lay the requirement on the manufacturer he'll come up with it. I don't think this is any big problem. It hasn't been done now, but it hasn't been pushed either. Yes, I agree; it should be done.

Capt. Rovelstad: Captain Heck?

Capt. Heck: Your recommendation is about the most encouraging thing I've heard in many a year, Gene. And just to make it complete, and aboard ship, would it be possible to include some recommendations relating to the sealing off of the overhead in ship's dental operatory rooms? This has been a source of problem to ship's dental officers for many years specially when there's a big heavy pounding vibration coming around the launch. You have dust, flaking material, things of this sort bouncing off of the ventilation tubes and there's an aluminum material currently being used in the major OR in the medical departments aboard ship. And I think something of this sort might be considered for future shipboard installation. And improved overhead lighting and sealed in or sound-proofed overheads to drown out the external ship's noises, Aircraft catapults, trucks, things being funneled back and forth on hanger decks and it would reduce some of the emotional trauma of the outside noises in the dental operating room. What do you think of that?

Capt. Nealon: Well it's very interesting that you brought that up. Because, as a matter of fact, this was done three years ago. As I recall it, 3 years or 4 years ago, Bob Wirthlin was in the office at that time and we tried to get BUSHIPS

to put an acoustical tile false overhead, with the illumination installed in the overhead. And my memory's not as good as it used to be but, as I recall, we were shot down by BUMED. We were shot down by Code 4. But I can't be sure about this. Ed, do you remember this?

Capt. Ed Sobieski: Yes sir, we were shot down. We were extremely delighted with specs.

Capt. Nealon: Well I would like to take the liberty of speaking for our study group and strongly urge this to be done--if I can get the concurrence of the study group.

Capt. Rovelstad: Are there any more comments or questions?

Capt. Middleton: I know the hour's getting late but since we do have the Air Force and Army here, would it be acceptable to/for someone to review the recommendations of all the study groups and to actually list all of the areas that still require some study--and then with a coordinated effort. We know that public health service is working on lighting, for example. I'm sure the Air Force has something up their sleeve, that a review of all the people concerned and a division of the labor and then maybe sharing of the profits that we might reap. I'd like to just throw a few more ideas in, for example: the use of carpeting (which no one has discussed, and I don't think they will today), lighting, which we haven't discussed because it really hasn't been pertinent to our meeting. And there are a dozen other areas in which we might improve our methods of operation and, consequently, treatment of patients.

Capt. Nealon: I think those are excellent suggestions and is really an on-going problem. I don't think you can ever stop and say, "Well we've achieved the ultimate." I think there's always something more to be done.

Capt. Rovelstad: Is it your wish that this be made a recommendation of the workshop? Here and now?

R. Adm. Kyes: I'd like to comment on that. I would recommend the coordination of our efforts very highly. We took a step 3 or 4 years ago when we all decided to get together on one exhibit. For the last 3 years, we've had a joint exhibit. Take things such as lighting... I think at Quonset Point 275 foot-candles of light was standardized for use in the operating room. Others continue to build OR's without enough foot-candles of light to lay brick. I think it would be wonderful if we could take up these subjects among all three services. Then we would have the capability for studying a few problems together and come up with better answers. That's one of our difficulties down at the Bureau. Every time we have a problem, the only way we think we can solve it is to bring someone in for a period of time to work on it. However, with the success of the step taken with the exhibits, it is criminal not to work together on other problems. I really feel very strongly about it. There are many mutual problems. I would second that very strongly.

Capt. Rovelstad : Colonel Dybowski?

Col. Dybowski: On behalf of General Lightner and the Air Force I would like to say that we've been privileged to participate in this conference with you and that we would appreciate further opportunity to do this. From my own experience, working with the other services, we have already worked together on the "Review of the Facilities Criteria" in which we think that we've made some progress. The deliberations of this conference could easily be included as part of the agenda for future meetings of this tri-service work group. The particular problem is the illumination. At present there is contractual agreement from the School of Aerospace Medicine for a feasibility study on illumination of dental operatories. They have contracted with an illuminating engineer who has made a survey of all types of illumination and will be making recommendations in the near future. So this is one area where something is being done and could certainly be included in the facilities criteria. One problem we get into is: when we're talking about layouts of dental treatment rooms, we have been under the impression that we should only concern ourselves with those things that are dental or medical in nature and not to concerned ourselves too much with facilities. However, as we see here, now we do have to make certain recommendations, (as have been done in the past) on air-conditioning and on sound-proofing. So, why not include lighting?

Capt. Rovelstad: Any other comments or questions? Are you willing to accept the report of Study Group Two? Make this a workshop recommendation? With the modifications of those comments that have been made? I believe that one specific recommendation was one that Bob Middleton made and also the other one that Mike made, I guess. Admiral Kyes followed that; and Colonel Dybowski. All in favor? Any objections? Carried!

I have written copy of that further recommendation form Workshop # I, "It's further recommended that future implementation of experimental concept should proceed at activities with varying missions such as a training center or air station, a port facility and aboard a ship." In a ship. Acceptable?

We'll proceed to Study Group III.

Topic of Study Group III

"Personnel utilization and staffing requirements."

General Charge: To provide general recommendations for the personnel to staff future Naval Dental Clinics. Consideration should be given to dental officers, specialists, dental technicians and supporting personnel to most effectively provide a complete dental service in relation to size of typical patient load.

Report of Study Group III

Capt. Moore: Our group was unable to come up with any earth-shaking recommendations. We seem to be in agreement that this is a fine idea and we should go ahead with it and we've sort of summarized our recommendations in the one statement that if facilities are provided and there is a need for personnel, we'll do everything possible to provide the personnel to man the facilities.

We accept the concept of four-handed dentistry for the future, that is, a dentist and a technician working together all the time. To implement this need for full-time chair assistants, two possibilities are recognized at this time; (1) Turning to civil service for dental assistants, for laboratory assistants, dental hygienists, receptionists, supply personnel, janitorial help etc; (2) Utilization of "G" billets for all Master-at-Arms, messengers, night watches, drivers, etc. The law sets the ratio of dentists to Navy personnel. Dental assistant personnel is limited to 11% of hospital corpsmen. These ratios are unrealistic and the numbers are wrong. There are 25,000 retirees in the Orlando area. We can't staff for them and we cannot staff for dependents. This is not to be interpreted as any lessening of pressure on Congress to establish a more realistic dental officer/technician ratio. By a study conducted in 1956 and 1964, this ratio was determined to be 2.3 technicians to each dental officer, rather than 1.75. I think we'd better take a long look at what Congress has allowed us and what we feel we need and then strike out strongly to get adequate staffing. It is assumed that in the future in dental activities, there will be more of the new treatment cluster, and we have decided that staffing 7 dental technicians and 5 dental officers is adequate.

1. Would you recommend that dental officers be assigned full-time chairside assistants for four-handed dentistry as a means for increasing efficiency?

For four-handed dentistry as a means for increasing efficiency, yes. A bare minimum for 4-handed dentistry under any circumstances.

2. Do you recommend that supply personnel, appointment personnel, and cleaning personnel be civilian or military personnel? Training?

It is recommended that supply personnel and appointment personnel be civilian or non-dental, particularly, if it will free trained dental personnel for purely professional treatment. Cleaning duties, to the fullest extent possible, should be delegated to other than professionally trained personnel. The small amount of training opportunity in supply and appointment desk duties (available in these areas) is not considered critical to the advancement opportunities of our enlisted personnel.

It's high time we did not require our Dental Technicians to pass examinations in areas where they are not experienced or where they have not been exposed.

3. Do you recommend that personnel be assigned as operating teams? Back-up personnel for absentees?

Personnel should be assigned as operating teams when they are compatible and for greater efficiency. Rotation of other personnel is encouraged for experience and these can be utilized as substitutes for absentees.

4. What recommendations do you have for reducing time-loss of dental personnel due to administrative matters?

Certain administrative duties have to be assumed by dental personnel. There are traditional built-in customs in the Service which cannot be denied to dental personnel when the rest of the Command have the privilege.

5. Can you recommend a specific staffing ratio for Dental Officers and dental technicians to patient treatment load? Explain.

If the patient treatment load can be determined per dental officer day we can staff accordingly.

1 DO/700 personnel
1 DO/90 recruits input

Should change staffing criteria to staff according to patient need instead of number of personnel.

Better dentistry is needed even if it means five technicians/dentist.

No. (cannot be specific) If one assumes a 4-year tour of duty for average naval personnel, under the present experimental system, each operating team could complete necessary restorations for 1000 persons based on the existence of about 15 carious surfaces per individual. This does not take into account the increment of new lesions over the 4-year span. One could only make a guess at the decrease in this 3.6 dental officer/technician to 1000 patients ratio due to treatment requirements other than carious-lesion restoration. One thing is certain, a requirement for 2 stannous fluoride treatments are required, and this could lower the ratio to somewhat in the area of 3.6 to 800. You just can't make a precise recommendation as to a staffing ratio for dental officers and technicians to patient treatment load.

I think we can define these objectives. We can determine what we must do then, I think. A specific staffing ratio, (which we can't offer you today), can then be determined from our past experience. And perhaps we can base it on the number of sittings per dental officer per day, and project it then for the future.

We may have to go to Congress and ask for more dental officers. We may have to ask for more dental technicians. We may have to beg out of the ratio in the Hospital Corps. We can't afford not to, as we would certainly not expect Medical to give up hospital corpsmen, so we can have more dental technicians.

But, if we're 11% of the hospital corps, we

either have to increase the ratio - or have some other criteria for establishing a staffing.

I think, what we'll probably end up with is a mixture of an increase of enlisted, and an increase of civilian staffing to accomodate the job we want done.

Discussion

Capt. Grossman: Gordie, we, to some extent, come back to the real world, and the real world today is the fact that we are going to be faced with things that are called Manpower Validation Teams. And Manpower Validation Teams will be a growing thing in the future, as I recall from a presentation we had in the Navy --- and has been building this program up for the last three years to approximately 250 some individuals in this Manpower Validation effort. The Air Force, I think, has something like 2000 people in Manpower Validation. They have a great many. And so the Air Force has been following -- well has been faced with the problem for -- since 1959. I think General Le May introduced this concept of having teams go in. They have sophisticated methods of work-sampling in relation to the needs of the population served etc. And this is one of the things with this particular concept that is being proposed here, that we are in agreement that this is a more ideal type of approach to the practice of dentistry, that it has to be proven out to an extent. If you have a Manpower Validation Team that would go into a standard operating clinic and do their work-sampling etc., they will come up with recommendations. However, we would always get a chance to rebut any recommendations that they make, and the few activities that they have gone into; we have always been fortunate enough to have a good recommendation. You might say, where you are doing a fine job, you either keep what you have or increase. But, every once in a while -- in one case, they actually recommended a cut. Now with this concept, if you did not have an activity with such a cluster operating effectively, and a Manpower Validation team came in and said "Well, it doesn't appear that you really need this many people," and say within the framework of five officers and seven technicians, that they recommend a decrease of two technicians, you have lost your whole concept. So this is a real problem that we are faced with.

They have also given us the responsibility so that we can identify our work centers and perhaps we can work out something so that this particular work center as we have established it, can be evaluated fairly and favorably in our favor. Because there are many other factors besides how much is produced in a unit time, because we are dealing with people and people have individual differences, this sort of thing has to be worked in and maybe after this long harangue, perhaps Gene can give us some experiences that the Air Force has had.

Col. Dybowski: Thank you Frank, I think that Capt. Moore put his finger on a couple of the areas that have been millstones around our neck, the one thing is that when you assign so many officers for a certain number of troops that you're serving this means that from there on in thats all that you will get. Now in the past this has helped us to a certain degree; in other words we have not been limited by the number of visits that the patients have. For example you might have a drop in the number of visits or sittings for a preceding period, so if you staff accordingly to the number of troops assigned this helps you, but you can only go so far with this and that. If you want to staff for retired or dependent population you have no way of showing what your work requirements are. Another thing is that the amount of sittings or the amount of procedures that you accomplished during a certain period of time, for example a year, is all that you were able to accomplish with the staff that you had on hand. It doesn't begin to define what your real work load was, what you could have done if you had been properly staffed to take care of everything --so--they can work this against us if we attempt to tie our requirements against procedures that we accomplished up to that point. The way we can proceed with this is to define the work centers, and I think this in essence is what this conference here is attempting to do. I believe I read this into what you are doing. You are showing work centers with this trapezoidal room, with the rotator personnel, with the recording of the procedure on the tape, with the CSR, -- these are all work centers that were not previously described. Well as we attempt to define these work centers this is where we build in our requirements for additional personnel. And this is the way we have to go because this is the formula that the manpower validation teams use and you speak their language if you can provide a convincing argument, because all that the work center, all that the management engineering teams have done so far when they have come into our existing facilities is end up with a conclusion that for the number of people we had that we did the amount of work that could be expected; but we knew this-- they weren't telling us anything by that, what we want them to tell us is that we need more people, and the way we can do it is to define these work centers and to actually isolate even those procedures that we considered all part of a general operation--we have to break those procedures into actual work center descriptions in such a way that they can see that that there's a requirement for a certain number of man-hours to get this job done.

Capt. Moore: That's very well put. Whether we like it or not these survey teams are going about and they are looking us over pretty well. We resent, I think, very often the fact that they try to evaluate our efficiency when they are not aware of our professional duties, and yet these are pretty sharp fellows and they seem to know what they are looking for and they can evaluate a whole picture very well and maybe its a healthy thing. I think it would help if manpower validation teams could see what we saw yesterday, and take a look at it, actually see it in operation.

Col. Dybowski: Just one more comment that was given to us straight from the shoulder by the manpower people and that was this; "Before you can ask for more people you have to convince us that you're getting the most out of the people that you do have", and this is where I think that your study here is beneficial; that you are showing, or that you will attempt to show in the future that you are trying to get the most out of the people you do have but that you still have an unfinished work load even after you've done everything that you could do.

Capt. Hunley: Capt. Paul (Moore) touched on the effective utilization of chairside assistants, and this has not been dealt on a great deal during this conference because of other things. I think Frank Ellis would be perhaps the first to agree that he cannot in the time that's allotted to him at the Dental Technician School at San Diego give us a finished chairside assistant. Those of us who work with the recent dental graduate would certainly have to conclude that he is not, as yet, effective in the utilization of that young man or girl that is given him. Recently at Chapel Hill, on a visit there I came across this booklet which is one of seven that the University of North Carolina's Dental School is publishing in the vein of a correspondence course that will allow the girl out in the boon-docks of North Carolina to become qualified, to become certified as a CDA. This particular copy, Volume 7, deals directly with chairside assisting. It is a tremendous, beautiful, piece of work in that it has pictorial graphic demonstrations all the way through tray setups by the various diciplines, operative dentistry, inlay preparation, silicate, endodontics, prosthodontics, oral surgery. Four-handed dentistry, beautiful pictures all the way. I would think that every clinic supervisor and every officer that is working with the training of technicians in order to increase our effictiveness with these people might want to give thought toward procuring a copy of this from the school of Dentistry, North Carolina, Chapel Hill. The cost is $5.00.

Capt. Rovelstad: If there are no other comments or objections, this report is accepted.

Topic of Study Group IV

"Clinical Routines for the future practice of dentistry."

General Charge: To provide general recommendations for the clinical routines to be followed in future naval dental clinics. This would entail patient scheduling, instrument handling routines, dental officers and dental technicians practices, hours, as well as the aseptic practices to be followed.

1. Do you recommend that preventive, diagnostic, restorative and surgical dentistry be programmed into a single dental operating suite?

It would be desirable to practice all the clinical disciplines in a single dental operatory. It is recommended that basic planning of DORs must include facilities for completion of any phase of dental treatment.

2. How should patient scheduling be accomplished for a dental operating suite?

Scheduling of patients should be accomplished in a manner that considers the following:

a. Patient availability
b. Treatment needs of the patient
c. Dental personnel and facilities available
d. Capabilities of the Dental Officer - technician team.
e. The procedures to be accomplished:

Central appointment facilities are encouraged by this group where this is feasible, and whenever possible the patient should be reappointed, with the same doctor and the doctor should be encouraged to complete his patient's treatment. However, the group believes that further study utilizing computer methodology to determine the most efficient ways of patient handling, record handling, scheduling, etc., at various types of dental facilities, should be accomplished.

3. What aseptic technique should be applied to the separate phases of dental practice?

Without scientific basis and until the facts are known, this group recommends the following minimum requirements to prevent cross-contamination for all phases of dental practice:

a. All instruments should be placed in packs and sterilized
b. The doctor and technician should thoroughly scrub their hands or glove them between patients.
c. Masks should be worn by the operator and his assistant.
d. Patient's hair should be capped or draped to isolate from the field.
e. Rubber dam should be used for all restorative procedures.

Additional precautions which may be considered are:

1. Pre-operative oral rinse to reduce bacterial contamination in the aerosol.
2. Facial preparation with a sponge containing an alcohol-iodine solution.

4. Do you recommend different routines for different activities?

Whenever possible, the treatment routine for all facilities should be the same. However, scheduling and programming will vary from activity to activity.

5. What cases should be referred to specialists?

The ideal treatment is rendered when the general dentist assumes responsibility for total care of the patient. He completes the history, examination and treatment plan. In keeping with his individual experience, training and ability, he does everything possible within the framework of his capabilities and insures he has prepared the patient before he arranges for

consultation, diagnosis and treatment by the specialist. The referring dentist's responsibility is completed only when optimum dental health is established and maintained.

6. What should be the priority for treatment of naval personnel?

The priority system in existence is considered to be satisfactory. However, in order to meet operational requirements (such as the nuclear power program, special warfare school, etc.) it may be necessary to make exceptions to these rules.

Discussion

Capt. Rovelstad: Thank you very much. May we have any comments or additions, subtractions, to this report? You're willing to accept this as a workshop report in total? Any objections? It is accepted.

Capt. Ludwick: I'd like to make a comment. I should like to request that Captain Rovelstad and his team be permitted to make what editorial changes that may be necessary in order to assemble all this so it might read more smoothly. If that would be agreeable to the group? So long as he doesn't change the meaning.

Capt. Rovelstad: That completes the reports of the 4 study groups. Does anyone have any after thoughts? Second thoughts? Regrets?

Col. Christopher: I would like to very briefly reiterate the sentiments expressed by Col. Dybowski and say that on behalf of General Shira and myself, we are delighted to have been invited to this, what I think is a milestone in military dentistry. I agree with Admiral Kyes that the three services certainly should constantly exchange information and if we avoid duplication of effort, if nothing else, why we'll continue making the progress that we've made so far. Thank you.

In general, the concepts of dental practice introduced in this project were well accepted by the participants in the workshop. The basic prinicples upon which it was based were considered sound and fundamental to the future practice of dentistry.

The design and layout of dental operatories and the supporting spaces of the experimental clinic were quite well accepted. The concept of having patients enter the operatory from one side of the operatory while the professional staff and services entered from the other side was considered particularly good. The shape and size of the operatory was considered to be adequate. Although the arrangement of operatories to central rotator stand and scrub area was considered effective, it was suggested that other layouts be tried in order to satisfy the needs of different activities.

The equipment selected for this study was considered capable of fulfilling the needs of a dental practice. However, there was considerable discussion about the need for modifications to meet specific specialties of practice; i.e., oral surgery and prosthetics. This was recommended for further study. Some participants in the workshop cited existing practices, however, that used the patient position followed in this study for oral surgery. For the most part, the equipment was found capable for supporting the practice of dentistry as demonstrated in the study. Certainly it was recognized that dentists and technicians had to be trained (or retrained) to practice using direct vision and to fully use the chairside assistant. Operating from the seated position was not new but doing so properly with minimum strain required special instruction. The equipment was believed to support this well.

The requirement of a full-time chairside assistant and "four-handed" techniques of practice was unanimously accepted. The general staffing of the clinic was considered adequate although there was some question as to whether the one rotator and one central sterilizing room assistant could fully keep up with five operating teams. The study demonstrated smooth function with this staffing but the workshop participants felt that it would require a particularly capable technician to handle these positions. Considerable discussion centered on the use of seven technicians to support five dental officers (not counting the appointment clerk, x-ray technician and lab technician) as opposed to the use of five to five in the standard clinical situation. However, this was still within the staffing ratio currently allowed and was accepted as a more efficient use of auxiliary personnel. The approach followed in this study was not considered related to the concepts of "expanded use of auxiliary personnel" wherein dental technicians actually carried out dental restorative procedures. This was not a part of the study. The investigators at the outset could not define procedures in dentistry where "two hands" could replace "four hands" efficiently and still practice "quadrant" or "full mouth" techniques. Therefore, this was recognized as unrelated to the study. The duties of the auxiliary personnel in this study were considered by the workshop participants to be well accepted by the dental technicians. However, it was not felt that the dental officers accepted their duties as well perhaps because it might be too concentrated an effort. It was recognized that there would have to be a change of pace for clinicians in such an environment as in any clinical situation.

The clinical routines, patient handling, instrument handling and sterilization techniques were considered effective. Particular interest centered on methods of sterilization which were considered superior. A list of minimum precautions to prevent cross-infection in the dental office was proposed by the workshop. Patient scheduling in relation to the amount of treatment per appointment was recognized as an important factor for efficient practice. Long appointments with total treatment was shown more productive than short appointments with limited treatment. In order to meet the future needs of the Navy, it was recommended that future dental clinics centralize services: cleaning, sterilizing and storage of instruments, as well as scrub areas for staff. Operative modules of five operatories around a central service area was recommended as was a clinic configuration that would separate patient and staff personnel traffic. It was further recommended that the clinical routines, design and equipment used in the experimental clinic of this study be introduced in some future dental clinics at other locations before making any decisions for a Navy-wide application.

Equipment selected for future dental operatories was recommended to support patient and dental officer-technician positions, as desired for operating from the seated position. However, there should be capability to support the dental officer's choice of operating position. It was recommended that the fixed dental unit ("gas pump") be omitted in future installations and compact equipment programmed to the operative field be selected. Further development of equipment was recommended.

It was recommended that dental officers take a strong interest in facility planning including supporting physical requirements.

The concept of "four-handed dentistry" was recommended for implementations as early as possible with adequate staffing to support. Several approaches to meeting staffing requirements were suggested. Non-technical duties should be delegated to other than professionally trained personnel.

Study Group I, Workshop I

Study Group I, Workshop I stated that while the circular design appeared superior to the conventional design, other configurations should be considered before a decision is reached on a recommended arrangement. This is certainly a good suggestion and one that would require a maximum effort. It might be suggested that perhaps a study could be initiated whereby the space for the operating suite could be developed in such a manner that it could be easily adapted to many configurations and designs. Perhaps then a decision could be reached on recommended arrangements and design.

Study Group II, Workshop I

Study Group II, Workshop I stated that the selection and arrangement of equipment has sufficient potential to warrant further development, and specifically recommended that energy be devoted to the development of an autoclavable tubing or hose for the handpieces.

This would be no problem if it were pursued in such a manner that manufacturers would meet the requirements. This is also applicable to the compact unit for right or left-handed operators, adaptable headrests for surgery and prosthetics, vertical capability for the instrument tray and, development of the rotator stand.

Study Group III, Workshop I

Study Group III, Workshop I stated that the study did not represent a proper approach toward the expanded use of auxiliaries, however they did state that; (1) four hands are definitely necessary at the chair, (2) the ratio of five dental officers to seven dental technicians in a five-chair operating suite is an efficient use of personnel and if this is accepted Navy-wide and in sufficient numbers, (3) would recommend a special rate or designator for the CSR and the rotating technician.

The investigators in this study have made an effort to report that, while the conventional philosophy of expanded use of auxiliaries may have merit and may someday be necessary to meet dental treatment needs, this study has shown a thirty five percent increase in surfaces restored through the consolidation of work centers and the additional use of auxiliary personnel to deliver instruments and supplies to the operating team, sterilize instruments and, transcribe recorded treatment from the dictaphone to the patient's record outside of the DOR.

Within the concepts of this study and the recommendations of the study group there doesn't appear to be any other logical approach toward the expanded use of auxiliary personnel. Perhaps a study of the more efficient use of auxiliary personnel in the areas of examination, diagnostic aids such as radiographs and study models, prophylaxis, prevention, polishing restorations, etc. would be indicated with the idea that greater support could be achieved for an operating suite such as the five-chair experimental clinic.

"A happy dental officer", was a phrase used to judge the experimental clinic. A military environment coupled with the rather rigid repetitive testing requirements of the experimental design places a certain amount of stress on young operator personnel to the point where application of this form of evaluation is fairly intangible. For example, an associate investigator in the study left to pursue other interests and yet how important is it to say that he was either happy or unhappy.

Subsequent testing of the experimental clinic which allowed the dental officer to utilize all of the concepts (asepsis, sit-down dentistry, four-handed dentistry, prepared packs, multiple procedures) of the study in providing not just operative care but total patient care (prosthetics, crown and bridge, periodontia, endodontia, oral surgery) revealed a very happy dental officer. Perhaps happiness is being able to utilize all of one's professional knowledge and training in total patient care and at the same time have the opportunity to increase or add to this professional knowledge and training, and wherever this is lacking one can assume that one will observe a certain amount of unhappiness.

Study Group IV, Workshop I

Study Group IV, Workshop I viewed the increase in surfaces restored and the increase in personnel as possible off-setting factors and recommended a determination of cost effectiveness. The number of patients seen per day was also viewed as critical with a given number of personnel. This study group did recognize that long appointments are more productive but could restrict the treatment of larger numbers of patients.

It is important to know what the requirements are and then to meet these requirements in the most efficient manner possible. If there are large numbers of patients that must be treated, (such as nuclear power candidates, or submarine school candidates) and this is often the case at a training center, then the study shows that longer appointments would facilitate the treatment of these large numbers of patients rather than to restrict the treatment, and at the same time the personnel requirements could remain stable.

It is important, also, to explain that all operators were trained and had the capability of using an aseptic technique, however, because of certain limitations such as a lack of autoclavable quick-connect tubing, syringes, etc. they did not

apply this concept in total.

Workshop I concluded with a discussion of the need for further continuance of this study and specifically indicated the following areas of study:

1. Cost effectiveness determination.
2. Further study of the aerosol problem.
3. Feasibility studies for endodontics, prosthodontics, periodontics, and oral surgery.
4. Further development of equipment and layout.
5. Clinic design studies for all types of Naval activities.
6. More sophisticated work sampling methods and more experienced officers to use and evaluate this concept and this equipment.
7. Develop the applicability of this concept afloat.

Study Group I, Workshop II

Study Group I, Workshop II recommends that cleaning, sterilizing, processing and storing instruments be centralized; that scrubbing, gowning and gloving be centralized; that the DOR be trapezoidal and the operating suite be circular and consist of five DORs or multiples of five. The group did not recommend standardization of the experimental design but suggested that it be tested according to the variability of practice and activity location.

Study Group II, Workshop II

Study Group II, Workshop II recommended that the "tree" or "gas pump" unit per se not be installed; that specialty equipment be mobile; and that all equipment support the concepts of feasible asepsis.

Discussion following this report indicated that all of the recommendations be reviewed and that other dental problems be considered also with the idea that a possible sharing with Public Health, Air Force, Army and Navy would result in a mutual effort that would benefit all.

Study Group III, Workshop II

Study Group III, Workshop II suggested that an effort could be made to change dental personnel requirements to meet the changing needs for practice as demonstrated by the clinical study. It was pointed out that use of personnel will come under the scrutiny of Manpower Validation Teams, but that the best way to justify the use of personnel is through the description of work centers -- similar to the work centers described in the research study.

Study Group IV, Workshop II

Study Group IV, Workshop II recommends that basic planning of DORs must include facilities for completion of any phase of dental treatment; that further study to determine the most efficient ways of patient handling, record handling, scheduling etc., at various types of dental activities be accomplished; that minimum requirements for prevention of cross-contamination be applied to all phases of dental practice; that the general dentist assume responsibility for total care of the patient; and that the priority system for treatment, presently in existence, be continued.

Discussion on Workshop Session

The workshop conference brought forth many interesting exchanges of ideas which were of mutual benefit to all. There can be no doubt in any conferee's mind that the workshop wants future Navy dental practice to:

1. Utilize four-handed dentistry at the operating chair.
2. Apply standards of asepsis to all forms of dental patient care.
3. Employ all methods available to reduce stress and strain for the operator and dental assistant and to make the patient comfortable during lengthy appointments.
4. Make a general practitioner responsible for total patient care and to provide facilities for completion of any phase of dental treatment.

There were challenges brought forth by the workshop session which require editorial comment by the investigators of the research study.

Challenge I. That long appointments are more productive than short appointments but may restrict the treatment of larger number of patients.

Challenge II. That a thirty-five percent increase in surfaces restored on the experimental side is off-set by forty percent increase in auxiliary personnel, which if you add short-term appointments for oral surgery, periodontics, endodontics, etc., could go as high as eighty percent.

Challenge III. That the circular design should be changed to simulate the "U"-shaped design used by Public Health, with the Patients' heads facing each other rather than the feet, thereby directing aerosols away from each other and away from the rotator.

Challege IV. The data presented did not convince us of a happy dental officer. " -- would not want to work like that eight hours a day, five days a week for twenty years ---".

Challenge I. Long versus short appointments.

The data from the experimental clinic shows that productive time per patient ranges from 39 minutes to 88 minutes. Surfaces restored per one hundred minutes productive time ranges from 9 to 13.1. (Table I)

In the 4th test period, which utilized the shortest appointments, each patient received (.39 X 9.5 = 3.7) 3.7 surfaces per appointment. In the 3rd test period, which utilized the longest appointments, each patient received (.88 X 10.2 = 8.976) 8.976 surfaces per appointment. (Table 2) If the average recruit has seven carious teeth,

Table I
Experimental Clinic

Test Period	1st	2nd	3rd	4th	5th	6th	7th	8th
Productive time/Pt.	61	43	88	39	55	44	65	62
Surfaces restored/100 min.	9	12.7	10.2	9.5	9.6	13.1	9.7	9.1

Table 2
Experimental Clinic

Test Pd.	Prod. time /Pt.	Surf. restored	Surf. rest'd/100 min.
4th	39	3.705	9.5
2nd	43	5.461	12.7
6th	44	5.764	13.1
5th	55	5.280	9.6
1st	61	5.490	9.0
8th	62	5.642	9.1
7th	65	6.305	9.7
3rd	88	8.976	10.2

then assume that he has 8.976 carious surfaces to be restored. In one appointment of 88 minutes duration, as in test 3, he would be completed.

If the recruit received 39-minute appointments as in test 4, he would require $\frac{8.976}{3.705}$ = 2.42) 2.42 appointments or a total time of (39 X 2.42 = 94.4) 94.4 minutes for completion, which is an increase of 6.4 minutes required or a 7% difference.

On the basis of this information it may or may not be significant to say that long appointments are more productive than short appointments. There are, however, many other considerations that must be taken into account, such as:

1. The number of dental appointments programed by a dental activity.
2. The total number of patients entering and leaving the clinic.
3. Transportation of patients to the dental clinic.
4. Time loss necessary for patient to knock off work and proceed to the dental clinic.
5. Time loss necessary for patient to leave clinic and return to work.
6. Work required in seating patients.
7. Work required in dismissing patients.
8. Number of instrument packs required.
9. Number of instrument packs that must be cleaned, processed and sterilized.
10. Number of instruments that must be handled by the CSR technician.

Utilizing 39-minute appointments as in Test 4, we would have to perform each one of the previous ten items 2.42 times as opposed to only once for the 88-minute appointments. That is 142% more work directly attributable to the shorter appointments. $\frac{(2.42 - 1}{1}$ X 100 = 142%)

Further, assume that there are one hundred such patients to be treated. Operator A, using long appointments (88 mins.) can see four patients per day (352 min. total) and would complete the group in 25 days, utilizing a total of 8800 minutes productive time. Operator B, using short appointments (39 mins.) can see nine patients per day (351 min. total) and would complete the group in 27 days utilizing a total of 9440 minutes productive time. If short appointments (Operator B) can treat 100 patients in 27 days, long appointments (Operator A) can treat 108 patients in the same time. That is an 8% increase in the number of patients completed, as opposed to the challenge that long appointments may restrict the treatment of larger numbers of patients.

Reflection on this data indicates that long appointments require 7% less total time, allows for an 8% increase in total patients completed, and requires 142% less work for the Navy housekeeping and supporting services.

The data from the Control Clinic is as follows:

Productive time per patient ranges from 34 minutes to 65 minutes. Surfaces restored per 100 minutes' productive time ranges from 6.8 to 9.4. (Table 3).

In the 2nd test period each patient received (.34 X 7.6 = 2.584) 2.584 surfaces per appointment. In the 8th test period each patient re-

ceived (.65 X 7.5 = 4.875) 4.875 surfaces per appointment. (Table 4)

If the control group in test 2 were to treat the 100 patients referred to in the previous experimental group they would require ($\frac{8.976}{2.584}$ = 3.47) 3.47 appointments for each patient or a total time of (34 X 3.47 = 118) 118 minutes for each patient. These patients in test 2 were scheduled every hour on the hour which allowed seven patients a day to be treated in one dental office. Using this same scheduling system, test group 2 would require ($\frac{11,800}{7 \text{ X } 34}$ = 49.5 days to complete the 100 patients.

If we were to compare the experimental clinic in test period 3 (table 2), with control clinic in test period 2 (table 2), and apply dollar-cost averaging to the personnel involved, we could say that in 49.5 days the control clinic would require (5 X 49.5 = 247 1/2) 247 1/2 dental-technician work-days. The experimental clinic would require (7 X 25 = 175) 175 dental-technician work-days. This is a difference of 42% in the cost of auxiliary personnel. To dollar-cost average the dental office personnel, the difference would be 98% more for the control clinic.

Challenge II. Increase in production off-set by increase in personnel.

In the control clinic five operating teams working in five conventional dental operating rooms can produce "X" number of surfaces restored in one day. Let X = 100. This means that each operating team produces twenty surfaces per day.

The experimental clinic, the data shows, can produce 35% more, or 135 surfaces per day.

In order for the control clinic to produce 135 surfaces per day they would need six and three quarters operating teams working in six and three quarters DORs. That would be a total of 13.5 dentists and technicians for the control clinic as opposed to 12 dentists and technicians for the experimental clinic. This represents an increase in personnel for the control clinic rather than for the experimental clinic, of 12.5%. (35% increase in officer personnel; 3.6% decrease in auxiliary personnel). There is also a 35% increase in DORs required.

If we dollar-cost average these figures the results would not support the challenge.

Table 3
Control Clinic

Test period	1st	2nd	3rd	4th	5th	6th	7th	8th
Productive time/Pt.	34	34	47	45	65	49	56	65
Surfaces restored/100 min	9.4	7.6	6.9	6.9	6.8	9.3	7.5	7.5

Table 4
Control Clinic

Test Pd.	Prod. time/Pt.	Surf. restored	Surf. Rest'd. /100 min.
1st	34	3.196	9.4
2nd	34	2.584	7.6
4th	45	3.105	6.9
3rd	47	3.243	6.9
6th	49	4.557	9.3
7th	56	4.200	7.5
5th	65	4.420	6.8
8th	65	4.875	7.5

These data were taken from our experience in operative dentistry only. If the same efficient methods of practice were applied to other services such as prosthetics, oral surgery, endodontia, crown and bridge, and periodontics, the same results could be expected. One could hardly believe that the addition of these services would require an 80% increase in auxiliary personnel as was stated in the challenge.

Personnel requirements should be balanced out by personnel allowances. At present the allowance is 1.75 DTs for 1 DO. Assume that a ten-chair clinic of experimental design was to be staffed accordingly. Assume that we want two five-chair operating suites in full production, five days a week in order to get the job done. Staffing requirements include the following consideration:

1. One DO for each operatory -- 10 DOs.
2. Time loss for leave -- 1 DO.
3. 10% time loss for traditional built-in customs of the service -- 1 DO.
4. One examination room for each five-chair suite to conduct examinations, patient work-ups, and treat emergencies -- 2 DOs.
5. Senior Dental Officer for administration -- 1 DO.

A total of 15 Dental Officers will be required to properly staff this clinic. A total of (1.75 X 15 = 26.25) 26.25 DTs will be the allowance. An 80% manning level gives us a net of 21 DTs.

Assignment	DOs	DTs
Ten DORs	10	10
Two Examination Rooms	2	2
Senior DO, Administrator	1	1
Annual leave	1	1
Time loss for service customs	1	1
Rotating dental assistant		2
Central sterilization room assistant		2
Appointments and records		1
Limited prosthetic dental laboratory		1
Total	15	21

A 100% manning level would give five more DTs. Auxiliary personnel may be augmented with Red Cross volunteers, civilian hygienists, civil service assistants etc., to provide preventive treatments, prophys etc. Realistically, staffing must include time losses for casualties, long pipeline transfers, sickness etc. There seems to be no reason why an 80% increase in auxiliary personnel would be required over present staffing allowances. We may be guilty of fearing something that doesn't exist.

Challenge III. Change circular design to control aerosols and splatter.

The data gathered from this study indicated that patients were placed in a supine position for all procedures. This results in the patients feet being placed higher than the head. Splatter and aerosols are directed equally in all directions as the patients mouth is pointing toward the overhead. To change clinic design would solve nothing. It appears that aerosols must be controlled by laminar air flow.

Challenge IV. Unhappy dental officers.

The experimental dental clinic can provide complete treatment for the patient utilizing prepared instrument packs to support multiple procedures per appointment. Testing of the clinic subsequent to the two-day conference indicates that each dental officer could practice complete care for his patient and that patient referrals were practically nonexistent in the type of patient we were treating (Navy recruits). Many times the same dentist would render for example, operative, surgical, and prosthetic treatment to the same patient at the same appointment, in the same office. Most dentists realize the fulfilment of their professional desires in an atmosphere of this type. Most dentists are happy. The data in table 9 page 12 indicates that each dental officer spent a total of 3 hours and 53 minutes productive time per day, which means he spent only that amount of time in the DOR. The rest of the time is spent in other duties required to support the clinic. Many variation in routine are experienced in the course of an eight-hour day.

In conclusion, it appears that the conference recommends that certain developments be implemented immediately within the present framework of Navy Dental Service. Other developments require further research, testing, and evaluation.

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13. ABSTRACT

A two-day workshop was convened for the purpose of reviewing a research study on dental operatory design and equipment layout. The first task was to view an experimental dental clinic in operation and receive preliminary data reports; the second was to review the findings and respond as potential users; and the third was to make recommendations for future needs of the Navy Dental Corps. The topics assigned to the study groups were as follows: Study Group I, "The design and layout of dental operatories and the supporting spaces of the equipment"; Study Group II, "The selection, arrangement and placement of equipment in the experimental clinic"; Study Group III, "The personnel, staffing and utilization of personnel"; Study Group IV, "Clinical routines, patient handling techniques, instrument handling techniques, and aseptic techniques." The workshop stated that the centralization of supplies and materials, and a place to clean, sterilize and store instruments was desired. It supported the use of four-handed dentistry, a rotating assistant and a sterilization assistant. It defined areas for asepsis in dental practice, and supported the concept of reducing stress and strain by allowing operators and assistants to work from a seated position. The workshop concluded that further studies were necessary to determine cost effectiveness and to develop the applicability of this concept of practice to various types of military installations.

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